

INSTALLATION DESIGN GUIDE

for

SUNDSTRAND'S

Mk VI

GROUND PROXIMITY WARNING SYSTEM

This Document provides preliminary design information for installation of the Sundstrand Mk VI GPWS onboard a "generic" Business/Commuter type aircraft.

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Revised & updated entire document, including page numbers.

All references within this document to the "DESENS" function have been changed to "GPWS FLAP OVERRIDE"

- Page 4 - Changed estimated "Down Time" from 20 - 35 to 40 - 60 hours.
- Page 7 - Added explanation of Flap Override option.
- Page 9 - Added expanded explanation of "Backcourse Inhibit" option.
- Page 10 - Added expanded explanation of "Alternate Mode 4B Threshold" option.
- Page 11 - Added expanded explanation of "Alternate Airspeed Expansion Range" option.
- Page 14 - Added "Time Constant" and Sundstrand Recommendation to Baro Altitude Rate input requirements.
- Page 17 - Updated information on Light Manufacturers.
- Page 29 - Updated Light Drawing: Rev F - West Coast Specialties
- Page 32 - Added color requirements for Flap Override light/switch.
- Page 37 - Pin 4, was Alternate Airspeed Scale Factor.
Pin 6 & 26, was 1 Watt = DC Ground, changed note.
- Page 41 - Added connector pin numbers to ALT 55 diagram.
- Page 42 - Added connector pin numbers to King 405 diagram.
- Page 50 - Added Notes 2 and 3.
- Page 51 - Pin 4 was: Alternate Airspeed Scale Factor.
- Page 59 & 60 Added.

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Sundstrand has prepared a book containing the latest revised copies of all documents and drawings (as examples only), that are required when making STC application to the FAA for installing the Mk VI GPWS on a Turbo Prop or Turbo Jet type aircraft.

Copies are available upon request.
Please contact:

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Marketing Representative,
Sundstrand Data Control, Inc.
(206) 861-6214

1. Introduction

This document provides basic guidelines, considerations and recommendations for the installation of the Sundstrand Mk VI Ground Proximity Warning System (GPWS) and associated system components. It is intended to assist the installer in estimating time and material, preparing the appropriate work instructions, to aid in the preparation of the STC drawing package, and to give a general overview of the installation effort.

This document assumes a familiarity with avionics installation practices, with systems onboard the aircraft being worked on, and access to manuals specific to the aircraft. Depending on the aircraft type, existing avionics, and particular equipment arrangements, the estimated installation "Down Time" on the aircraft is expected to be 40-60 hours. This assumes the radio altimeter is already installed.

The information contained herein, together with general procedures outlined in FAA AC.43.13, must be followed carefully to assure a safe and electrically sound installation.

The contents of this document are for **information and reference only** and must not be construed as formal FAA approved work authorization. The formal "Installation Manual", or "Procedure", or sometimes identified as "Engineering Authorization", will be issued as part of the STC Installation Drawing Package.

2. System Description

The Sundstrand Mk VI is a simple Ground Proximity Warning Computer in non-ARINC form optimized for installation in and operation on Business/Commuter aircraft. The system provides Alerts and Warnings for inadvertent flight into terrain and meets or exceeds the FAA minimum performance requirements of TSO-C92b, RTCA DO-161A and CAA Spec No. 14.

For detailed System information please see Sundstrand document No. 965-0686-601, "Product Specification for Commuter/Corporate Mk VI Ground Proximity Warning Computer, SDC Part No. 965-0686-001".

The Mk VI is designed to be installed in aircraft with DC analog interfaces. This would include, but not be limited to, the following general aircraft types:

BAe Jetstream 31, 31 Super & 41	DeHavilland DHC-6 Twin Otter *	Fairchild Metro II/III
Beech C99 & 1900	Domier DO228	Gulfstream 1
Casa C212-220/300 Aviocar	Embraer 110 Bandeirante	Shorts 330
Catpass 200	Embraer 120 Brasilia	

*Note: The Mk VI will also interface with aircraft having non-retractable landing gear or floats.

3. System Block Diagram

The GPWS is powered by the 28 VDC bus and consists of the Mk VI Ground Proximity Warning Computer, contained in a rack mounted avionic type LRU, and the following (typically onboard and existing) signal sources:

Radio Altimeter
Air Data Computer or equivalent
Glideslope Receiver
Landing Gear logic
Flap position logic
Vertical Gyro (optional)

See Figure 1 below for the System Block Diagram of the Mk VI GPWS.

Mk VI GPWS - SYSTEM BLOCK DIAGRAM

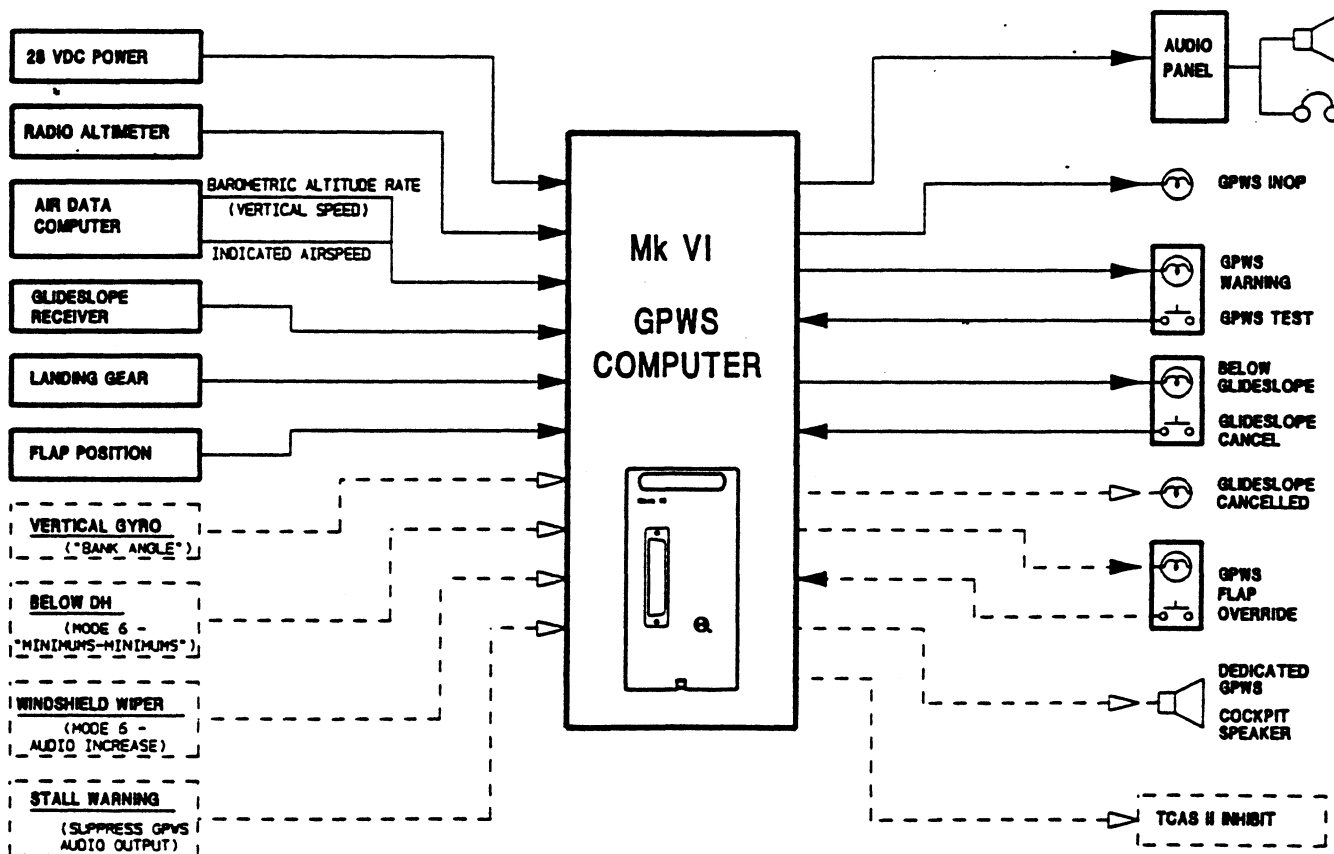


FIGURE 1

- - - - - OPTIONS

4. Mk VI - Standard Features / Options

Standard Features: System

- o Mk VI GPWS predicts impending impact with the ground.**
- o Giving visual and aural warnings and advisory messages for the following flight conditions:**

MODE 1	Excessive Descent Rate
MODE 2	Excessive Closure Rate to Terrain
MODE 3	Descent After Takeoff
MODE 4	Insufficient Terrain Clearance
MODE 5	Descent Below Glideslope
MODE 6	Aural Altitude Callouts : (Optional)

**"Minimums Minimums", "200" feet, "500" feet
and "Bank Angle"**
- o Silent during routine flight operations.**
- o GPWS controlled by FAA, and CAA requirements:**

TSO-C92b	Technical Standard Order
RTCA/DO-161A	Minimum Performance Standards
CAA Spec 14	Ground Proximity Warning System
- o Pilot can desensitize the GPWS when landing flapless or with partial flaps to eliminate unwanted alerts and warnings.**
- o All aural warnings and advisory messages are heard either thru the Pilot's and Co-Pilot's interphone headsets, or the cockpit speaker, or both depending on the settings of the audio control panels.**

Standard Features: Hardware

- o 28 VDC Power**
- o Low Power Consumption:**
 - < 5 watts in a non-alert/warning mode**
 - < 20 watts in a warning mode and producing a 4 watt RMS audio output into an 8 Ohm speaker**

- o No cooling air is required
- o Vibration or Shock mounting not required
- o DC Analog, Discrete interface
- o Light weight: Less than 4.2 Lbs
- o Packaging: Non-ARINC form factor. Uses standard 3 inch King Radio rack. Computer can be mounted in any orientation and may be located in a pressurized or non-pressurized area. Minimum operating temperature to be -40 deg C.
- o Interface via front panel connector (78 pin series D-Subminiature)
- o Designed to operate to environmental conditions per RTCA/DO-160B
(For specific categories refer to Sundstrand Product Spec No. 965-0686-601).
- o One spare circuit board slot for future expansion

Optional Warning Features:

The Mk VI features two types of customer selectable options which are selected at the time of installation. The first type is "wiring selectable" and the second is "program pin selectable".

Options (Wiring Selectable)

The following options are warning functions which are included within the Mk VI, and are selected at the time of installation by connecting wire(s) from the appropriate signal source to the designated pin at the Mk VI interface connector.

Flap Override (Sundstrand Recommended)

This option is used for operational flight situations where the pilot must land flapless, or with partial flaps. The pilot can modify the GPWS to eliminate unwanted alerts and warnings. This feature can also be used during operations at airports located in terrain where steep or incompatible terrain clearances are involved. This feature is activated by momentarily pressing a light/switch located in the cockpit within sight of each pilot. When this feature is active, the GPWS will illuminate the "GPWS FLAP OVRD" light to remind the pilots that this feature has been activated. After landing, both the feature and the lamp will automatically reset to the OFF condition. This feature can also be manually deactivated in flight by again pressing the light/switch. Each pressing of the

light/switch during flight will alternate the ON/OFF state of this feature. The use of this Flap Override switch will be controlled by each Air Carrier/Airline's Operational Procedures. Use of the Flap Override feature eliminates the need for full landing flaps, retains other GPWS functions and modifies the GPWS Alert and Warning envelopes to minimum performance, thus allowing operations that might otherwise cause the GPWS system to generate nuisance warnings.

Additional Explanation: Flap override can be used to partially de-sensitize the Mk VI during portions of flight that might otherwise produce unwanted warnings due to entering flight warning envelopes from Modes 1, 2, 3, or 4. It is not used for Modes 5 or 6. It basically shifts the envelope to the right and down by a calculated amount. An example of this would be for Mode 1 (Excessive Descent Rate). This mode is for alerts and warnings for excessive barometric descent rates with respect to the Radio Altitude during descent and approach phases of flight. If, for example, an aircraft were at a Radio Altitude of 800 ft and had a baro rate of -2000 fpm (losing altitude), the aircraft would enter the boundary of an envelope that would produce a "Sinkrate" message. If for a particular reason, the pilot had a need to operate the aircraft in this manner during an approach, then he or she could avoid this message by engaging "GPWS FLAP OVRD". In this case it will shrink the envelope by 300 fpm baro rate. Therefore, for the same 800 ft Radio Altitude, the pilot would need to exceed 2300 fpm negative baro rate before penetrating the envelope. Some other affects of engaging Flap Override are:

- a. Cancels Speed Expansion portion of warning envelopes.
- b. Selects Mode 2B instead of Mode 2A.
- c. Selects Mode 4B instead of Mode 4A.
- d. Shifts Mode 1 and Mode 3 to the right (shrinks envelope)

"Bank Angle" (Sundstrand Recommended)

Will alert the flight crew of severe overbanking during initial climb out or approach. The alert also helps crew awareness of excessive roll angle correction for runway alignment near the ground during partial visual breakout. (See page 46 for wiring info).

Altitude Callouts: (Sundstrand Recommended)

"Minimums-Minimums"

Announces a "Minimums-Minimums" aural alert for descent below the DH bug setting on the Radio Altimeter Indicator. (See pages 41 & 42 for wiring info).

"200"

Announces "200" feet AGL altitude callout on each approach. Option is already present in the Mk VI unit. (May be disabled, see page 11).

"500"

This "500" feet AGL callout occurs only when the aircraft is on any approach where the ILS glideslope is unavailable, or the aircraft is more than 2 dots below the glideslope. This callout improves altitude awareness on non-precision approaches. Option is already present in the Mk VI unit. (May be disabled, see page 11).

Reduced Mode 6 audio alert level (Sundstrand Recommended)

With this feature enabled, the Mode 6 messages (described above), and the Glideslope message are reduced 6db from the GPWS audio level selected at time of installation. However, during a noisier than normal approach (i.e. rain condition), the activation of the windshield wipers will return the audio level of these messages back to it's pre-selected level with no attenuation. (See page 49 for wiring info).

Stall Warning - Suppress GPWS audio output

This feature inhibits the GPWS audio output during a Stall Warning condition. (See page 48 for wiring info).

Backcourse Inhibit

This feature will inhibit Mode 5 (Descent Below Glideslope) during a backcourse approach. (See page 45 for wiring info).

Expanded Explanation: When a pilot elects to land at an airport using a "Backcourse" approach and has ILS selected, roughly five percent of the time a nuisance "Glideslope" alert message may occur. The normal Glideslope signals are projected at a fixed angle with a center beam at roughly 3 degrees up from the ground. Due to the nature of the Glideslope transmitter, signals (beams) are radiated backwards from the intended direction and do not hold a fixed position. Therefore it is possible when using a Backcourse, with the ILS selected, to intercept a false center beam or below the beam signal. This signal, though not usable for an ILS approach, will cause the Mk VI to issue a "Glideslope Warning". This "Backcourse Inhibit" option is used in aircraft that have Glideslope receivers that can select a Backcourse approach, and provide a suitable signal to the Mk VI. Installed this way, the Mk VI will automatically inhibit Glideslope during a Backcourse approach. This insures that during normal ILS approaches the Mk VI will not be inhibited

for Mode 5. If the operator does not have a Glideslope receiver or other instrumentation that can select Backcourse approaches, the Glideslope Cancel should be used to shut off a nuisance output.

TCAS Inhibit

This feature inhibits a TCAS II warning only during an actual message output from the GPWS. (See page 51 for wiring info).

Glideslope Cancelled Light

This advisory lamp will be illuminated with manual cancellation of the Mode 5 Glideslope; i.e. this light reminds the crew that the Glideslope warning mode has intentionally been cancelled. This light will remain on until it is automatically reset by descending below 50 feet AGL or climbing above 1900 feet AGL, or by deselecting the ILS frequency. (See page 50 for wiring info).

Options: (Program Pin Selectable)

The following options are functions which are included within the Mk VI, and are available at the time of installation by connecting a wire from the appropriate "program pin" of the Mk VI mating interface connector to a nearby aircraft DC ground located near the computer.

Audio Output Levels

The GPWC provides a selection of four different audio output levels. The power output at each level is: 1/2 watt, 1 watt, 2 watts, and 4 watts RMS into an 8 ohm speaker. The Sundstrand recommended nominal audio level is the 2 watt setting. These program pins also select the audio levels for the GPWC 600 ohm output. (See page 48 for wiring info).

Alternate Mode 4B Threshold

Selects 150 feet minimum for Mode 4B instead of 170 feet minimum. (See page 51 for wiring info).

Expanded Explanation: This option selects 150 feet minimum for mode 4B instead of 170 feet minimum. When the landing gear is lowered, or the GPWS Flap Override is selected, the Mode 4B envelope is active. For airspeeds below 150 knts (normal) or 120 Knts (alt speed modified), a "Too Low Flaps" warning

will be issued when the aircraft has Flaps up (not in landing position) and Radio Altitude is less than 170 ft AGL. This option is for those operators that don't normally have flaps in the landing position at 170 ft AGL, or for the operator that occasionally operates below 170 ft AGL with flaps not in the landing position. This option lowers the boundary to 150 ft AGL before penetrating the boundary and causing a warning. Most operators will not want or need this option.

"200" Foot Callout - Inhibit

Disables "200" foot callout from Mode 6 Altitude Callouts. (See page 51 for wiring info).

"500" Foot Callout - Inhibit

Disables "500" foot callout from Mode 6 Altitude Callouts. (See page 51 for wiring info).

Alternate Radio Altimeter Scale Factor (ALT 55 series or KRA 405)

Changes the Radio Altimeter Scale Factor input from the ARINC 552 to accommodate the use of the Collins ALT 55 series, or King's KRA 405 Radio Altimeters. (See pages 41 & 42 for wiring info).

Alternate Airspeed Expansion Range

Shifts Airspeed Expansion range down 30 knots. (See page 51 for wiring info).

Expanded Explanation: This option is primarily for operators of relatively slow flying aircraft. This option will allow these aircraft to activate or penetrate the airspeed expansion function at 30 Knts slower than faster flying aircraft. When aircraft enter the "Speed Expansion" portion of an envelope, the upper Radio Altitude boundary increases linearly as airspeed increases. This "Speed Expansion" function only applies to Mode 2A and all of Mode 4 (4A, 4B and 4C). For most slow flying aircraft this feature will probably not apply for Mode 2A, because the minimum airspeed to enter this portion of the envelope is 220 knts for aircraft without this option and 190 knts for those with.

The following should help illustrate the relationship between Alternate Airspeed Expansion option and the Speed Expansion portion of an alert envelope:

Mode 4A - Proximity to Terrain, Gear Up

In this scenario, a pilot will fly at a little less than 500 AGL and maintain this clearance above the terrain.

If the pilot flies the aircraft at less than 178 knts at this level above the ground with the gear up, the message "Too Low Gear" will be heard and repeated until the gear is lowered, or the aircraft goes above 500 AGL. If the speed of the

aircraft increases beyond 178 knts, the aircraft will enter the "Speed Expansion" curve of the envelope and the message will change to "Too Low Terrain". With an increase in airspeed, the minimum terrain clearance increases linearly to a maximum of 750 ft AGL at 200 knts. Slower aircraft that have the Alternate Airspeed Expansion option will enter this same expansion envelope at 30 knts slower airspeed (148 vs 178). Thus they will benefit from increased warning time before flight into terrain. Note these airspeeds and envelope parameters pertain only to this mode. See Product Specification 965-0678-601 for information on Mode 2A, 4B and 4C. The idea is the same.

Fixed Landing Gear

Modifies the warning criteria to accommodate a Fixed Landing Gear or Float Aircraft. (See page 44 for wiring info).

Invert Flap Logic

Inverts the Flap direction logic for either 28 vdc active or ground active signal levels. (See page 47 for wiring info).

5. Required Equipment

Mk VI GPWS Computer

Sundstrand Data Control PN 965-0686-001

Radio Altimeter & Indicator

The following specifications are ARINC 552 Radio Altimeter signal output characteristics required for use with the Mk VI GPWS: (See Sundstrand Product Spec No. 965-0686-601 for specific requirements).

Range = -20 to 2500 feet

Scale Factor= (below 480 ft) $V = 0.02h + 0.4$

= (above 480 ft) $V = 10 \log(n) [2.7182818 (h+20/500)]$

h = height above ground

Validity: = +20 to +30 VDC; Indicates unit is operating properly.

DH = <3.5 VDC; below DH (Optional). Not to be confused with out of track.

Note: Use program pin P1-8 to revise the above inputs for use with the Collins ALT 55 series and King's KRA 405 Radio Altimeters. (See page 41 for wiring info).

Note: Radio Altimeter System should include Indicator, preferably with "Trend Indication".

For list of Sundstrand recommended Radio Altimeter systems and manufacturers, refer to page 54. For compatibility reference chart see page 59.

Air Data Computer

The Mk VI GPWS uses two input signals from the Air Data Computer:

Barometric Altitude Rate (Vertical Speed)

Airspeed (Indicated) (See "Airspeed", page 15)

In early 1991 Sundstrand conducted a survey of the equipment installed on Part 135 aircraft and found that approximately 60% of the aircraft do not have a useable air data signals. The following information will assist customers in finding and selecting a reliable source at a reasonable cost.

The following are specifications of Air Data signals required for use with the Mk VI GPWS: (See Sundstrand Product Spec No. 965-0686-601 for specific requirements).

Baro Altitude Rate: (Differential Input)

Range: +/- 20,000 FPM; (+) = increasing altitude
Scale Factor: 500 mVDC/1000 FPM; 0 VDC = 0 FPM
Accuracy: +/- 5% of reading
Validity: +18 to +30 VDC
Time Constant ** = 1.25 seconds maximum

Airspeed: (Differential Input)

Range: 90 - 270 Knots
Scale Factor: +10.0 VDC / 450 knots
or .02222 VDC / Knot; 0 VDC = 0 Knots
Accuracy: +/- 5% of reading

**** Sundstrand Data Control recommends that the Baro Rate Vertical Speed filtering delay (Time Constant) input from the Air Data Computer, used with any Ground Proximity Warning Computer, be kept to an absolute minimum. For best performance of the Mk VI Ground Proximity Warning Computer we recommend a time constant of no more than 1.25 seconds.**

Air Data Computers with longer Time Constants will delay warning messages in several modes. This can potentially lessen the time the pilot has to respond to a GPWS warning message. This criteria of 1.25 seconds max. will take advantage of the Mk VI design enhancements resulting in decreased lag in timely alerts and minimum "Sinkrate" warnings after recovery (nuisance warnings) from a Mode 1 and particularly Mode 3 envelope penetration.

Some Air Data Computers are not acceptable for use as a source of Air Data for a Ground Proximity Warning System.

The following low cost Air Data Module has been flight tested with the Mk VI GPWS by Sundstrand. This model has both Altitude Rate & Airspeed, and has met or exceeded the GPWS requirements. This Air Data Module is manufactured by:

Computer Instruments Corporation

C.I.C. Model 8800M C.I.C. Part No. 04077

Contact: Bob Wentzel (National Sales Manager)

(516) 876-8400 Ext 233 (516) 876-9153 FAX

The following are some additional manufacturers of DC powered Air Data Computers that could be contacted for information and selection regarding usage with the Mk VI GPWS. See Sundstrand document "Air Data Module Component Specification" No. 060-3943-000 for specific Air Data requirements.

Collins -

Contact: Jules Yoder, Systems Engineering (319) 395-2769

B & D Instruments & Avionics, Valley Center, N.Y.

Contact: Gary Richards, Director of Sales (316) 755-1223

Penney & Giles Avionics Systems Ltd, United Kingdom

Contact: Christopher Thomson, Rep. (213) 393-1497

Rosemont Inc Aerospace Division, Burnsville, Minnesota

Contact: Michael Dupont, Rep. (206) 451-1111

Smith Industries, Clearwater, Florida

Contact: Glenn Conrad, Product Support (813) 539-1631

For compatibility reference chart see page 60.

An **airspeed** input to the Mk VI GPWS provides increased warning times (at higher speeds) for Modes 2B, 4A & 4B.

Note: All references to airspeed, within this document, will mean **"Indicated Airspeed"** for use with the Mk VI GPWS.

For those aircraft with fixed gear or floats, a "Q Switch" is required. This "Q Switch" provides a signal to the Mk VI GPWS which simulates a gear down condition when the airspeed is at an appropriate pre-selected gear down speed. (See page 44 for wiring info).

Note: Many aircraft types have different cruise and landing speeds. In addition, for similar aircraft type, airlines have different operation requirements. This requires different "Q Switches" with different part numbers to match the speed threshold setting of the "Q Switch" to the characteristics of the aircraft.

The following are some of the recommended sources for "Q" Switches:

Advanced Aero Safety, Inc, Renton, Wa

Contact: Sherman Hall (206) 228-0960

Lear Sigler / Astek

Contact: Dick Strigle, (616) 241-7183

Glideslope Receiver

The following are specifications of the Glideslope signal output as required for use with the Mk VI GPWS: (See Sundstrand Product Spec No. 965-0686-601 for specific requirements).

Glideslope Deviation:

Range:	+/-150mV (μ A) = Complete full deflection of the G/S needle.
Scale Factor:	75 mVDC / dot
Validity:	+20 to +30 VDC (Logic) or, Low Level +/-250 mVDC
ILS Freq Sel:	+20 to +30 VDC or <3.5 VDC
ILS Backcourse	+20 to +30 VDC or <3.5 VDC

The Mk VI GPWS was designed to function with Glideslope Receivers manufactured to TSO C34c. The following models have met or exceeded the TSO requirements.

Collins	VIR-32 Nav Receiver
Bendix/King	KN 75
Bendix/King	KX 155/165
Bendix/King	KNR 634

Vertical Gyro (Required only if "Bank Angle" option is desired)

The following are specifications of the Roll Attitude signal output as required for use with the Mk VI GPWS.

Roll Attitude Synchro:

Stator Voltage	11.8 VAC leg to leg (nominal)
Synchro reference:	26.0 VAC (nominal)
Index Ref:	0 Degrees Roll
Range - Input:	+/- 180 degrees Range for GPWC: +/- 80 degrees
Scale Factor:	1 Degree roll per degree synchro
Rotation:	0 to +80 deg synchro for 0 to 80 deg Roll

Lights

The Mk VI GPWS provides visual warnings, in addition to aural warnings. The visual warning is provided by the GPWS Lights located in the cockpit and in front of the pilot & copilot, usually mounted in the glareshield or on the instrument panel. The lights are as follows:

GPWS Alert / Warning light	"GPWS"	Red
Self Test	"P/Test"	(press) light/switch
Glideslope Alert light	"BELOW G/S"	Amber
Cancel	"P/Cancel"	(press) light/switch
GPWS Flap Override light	"GPWS FLAP OVRD"	Blue or White
Switch*	(switch)	(press) light/switch
System Validity light	"GPWS INOP"	Amber
Glideslope Cancelled light	"G/S CANCLD"	Amber
(Optional)		

* The activation of the "GPWS FLAP OVRD" light/switch will alter the GPWS warning modes. Therefore, the design of this light includes a "see thru" switch guard feature to prevent accidental activation of the switch. This light remains illuminated when this feature is enabled. See page 57 for additional information.

Cockpit layout, size and operator's preference will determine if only one set of lights is used (i.e. mounted in the center), or if dual sets are used (one on each side). Refer to pages 32 thru 34 for physical description and recommended cockpit location for lights.

Although several Light manufacturing companies are capable of making these lights, Sundstrand has been working with a local company which now has tooling completed for these lights. In addition, because of the flexibility of the design, there are many arrangements possible. This light manufacturer is:

West Coast Specialties, Issaquah, Wa

Contact: Chuck Doland, Technical Support (206) 392-3118

Bruce Maxwell (Rep), Order Entry (206) 232-2871

Other Light Manufacturers:

Korry Electronics Co., Seattle, Wa Donna Leder (206) 281-3572

Aerospace Optics, Fort Worth, Texas John Richmond (817) 451-1141

Eaton, MSC Products, Costa Mesa, Calif

Airtechnics Inc (Dist) Larri Brown (316) 267-2849

6. Installation Parts List

The following is a sample "Installation Parts List" that would be used for installing the Sundstrand Mk VI GPWS on a typical Part 135 Aircraft. This list gives a general overview of the parts required and can be used for estimating the cost of the effort. This list does not include fasteners, hardware, harness provisions, wire, pneumatic fittings, special brackets and other such minor items.

No.	Qty	Item	Vendor	Part No.	Note
1.	1	Mk VI Computer	Sundstrand	965-0686-001	
2.	1	Mounting Rack	Bendix / King *	071-04003-0002	1
3.	1	Connector, Computer	Positronics *	DD78F10LVLC-15	2
4.	1	Air Data Module	CIC	04077	3
5.	2	Light Ay, GPWS & G/S	West Coast Spec.	90-81401-001	4
6.	1	Light Ay, GPWS FLAP OVRD	West Coast Spec.	90-81401-006	4
7.	1	Light Ay, INOP	West Coast Spec.	90-81401-002	4
8.	1	Light Ay, G/S CANCLD (Opt)	West Coast Spec.	90-81401-007	4
9.	1	Circuit Breaker (GPWS)	Klixon (T.I.)	7277-2-1	5
10.	1	Circuit Breaker (ADC)	Klixon (T.I.)	7277-2-1	5
11.	1	Radio Altimeter	(See page 13)		

Note 1 Mounting Rack is available from Bendix / King, Olathe, Kansas
Contact: Bendix/King Order Desk: 1-800-877-5464
(*Ref: Sundstrand Part No. 405-0383-001)

Note 2 The Positronics PN shown includes connector, contacts, hood and slide lock.
Contact: Positronics 1-800-641-4054
(*Ref: Sundstrand Part No. 440-1158-002)
See page 23 for alternate connector selection.

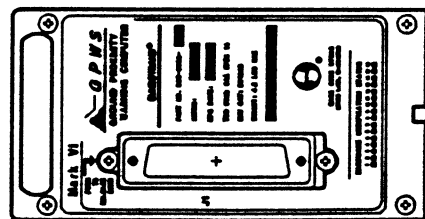
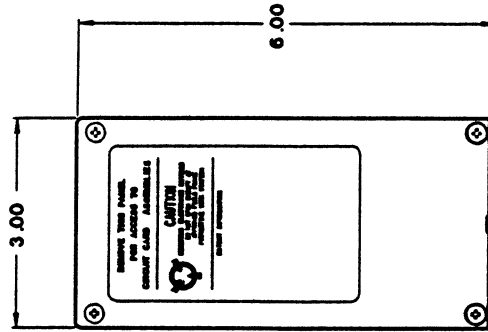
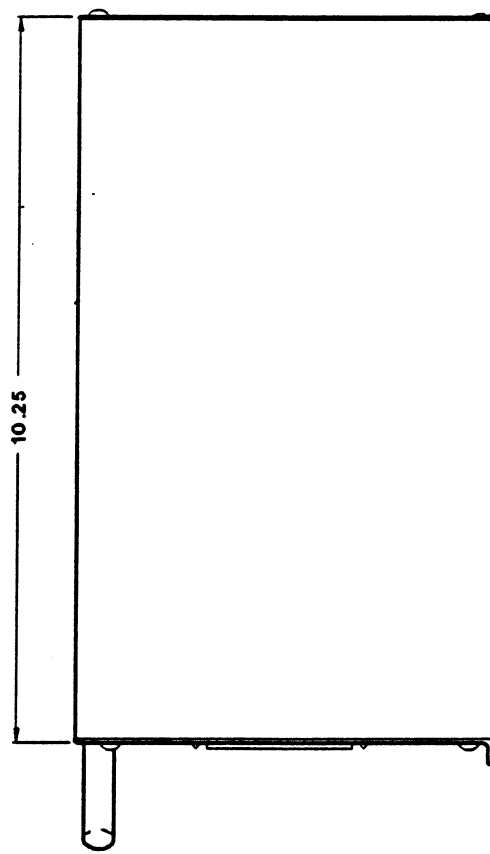
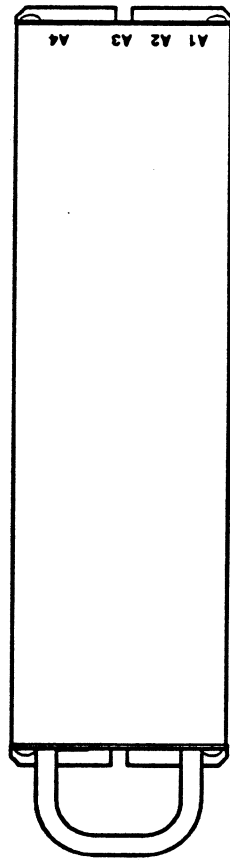
Note 3 See pages 14, 15, 43 & 44 for Air Data Computer information.
An installation kit (incl. connector, backshell, hose and fittings) is also available from CIC.
Call for information. See page 14.

Note 4 See pages 17, 32, 33 & 34 for Light information.

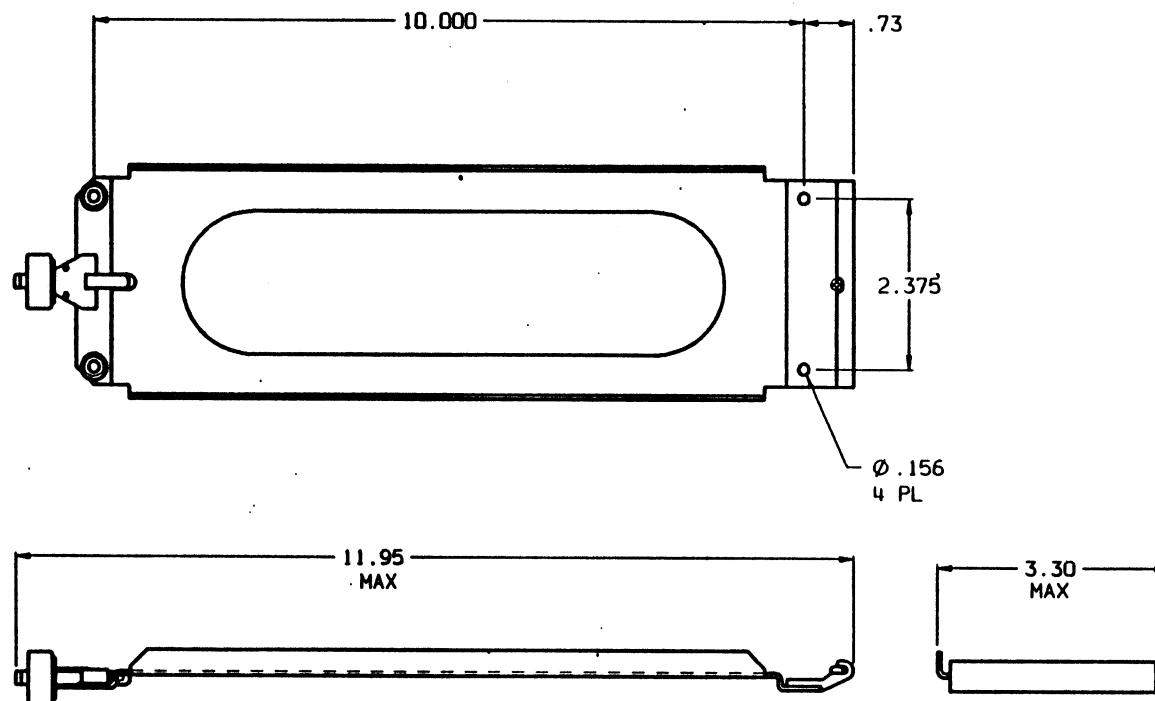
Note 5 Circuit Breaker needs to be a low amperage, push-pull, 1 Amp as identified above or equivalent.

* These parts are also available from Sundstrand (Pricing includes normal Sundstrand markup).
Contact your regional Sundstrand salesperson.

* Custom kits of cable assemblies, pneumatics, and various installation hardware may be provided by specialized companies, simplifying aircraft fleet installations. One company that has offered their services is: Electronic Cable Specialists, Todd Lyda, Sales Engineer (414) 529-5500.

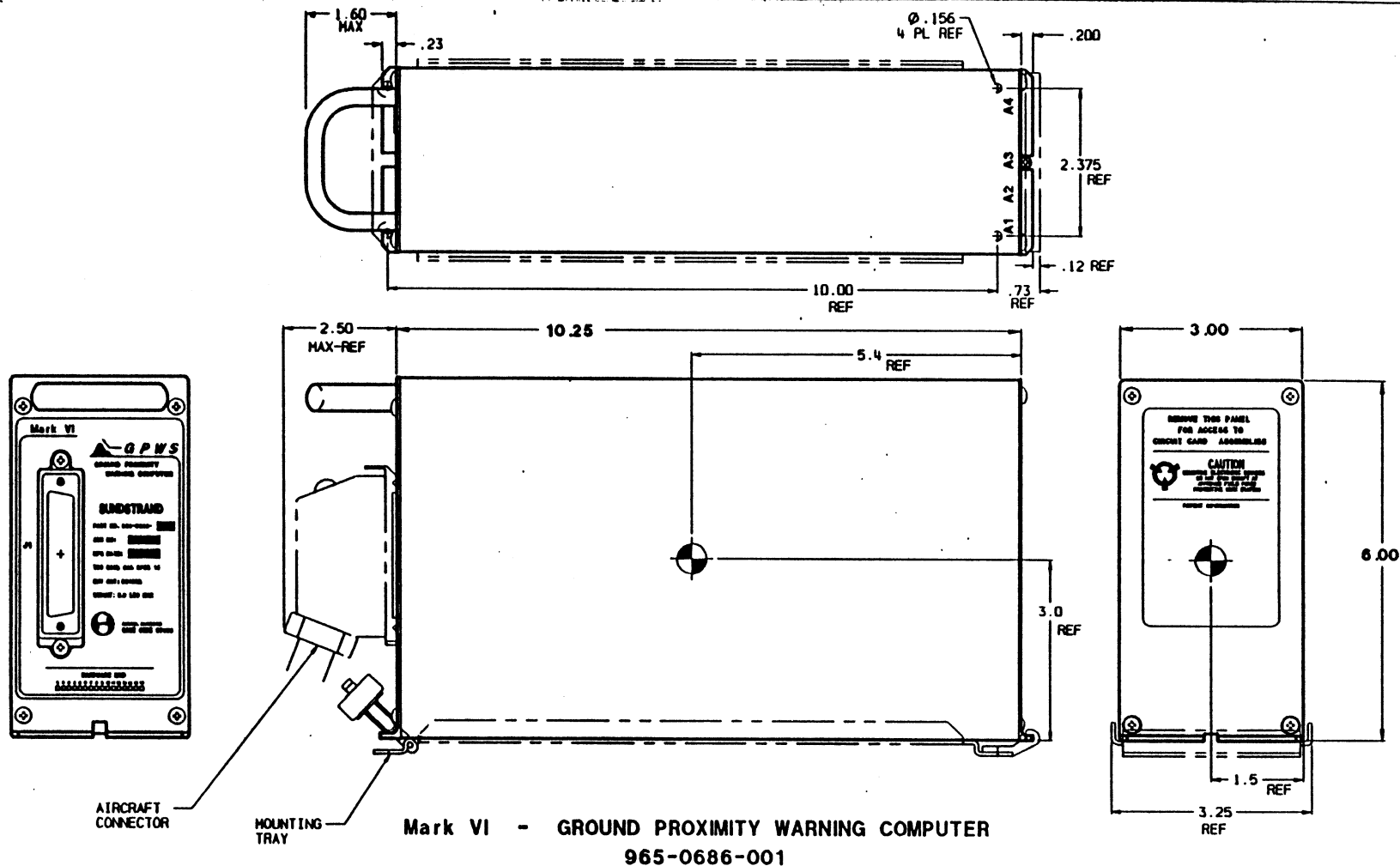


Mk VI GPWS COMPUTER OUTLINE
SUNDSTRAND PN 965-0686-001



MOUNTING RACK

BENDIX / KING PART NO.
071-04003-0002



TOLERANCE: .XX = +/- .04
 .XXX = +/- .015

COMPUTER / RACK INSTALLATION

COMPUTER, GROUND PROXIMITY WARNING

PART NO. 965-0686-001
 PACKAGE SIZE: AS SHOWN ABOVE
 WEIGHT: 4.2 LB MAX
 POWER: 5 WATTS MAX (NON-WARNING)
 COOLING: NONE REQUIRED
 INSTALLATION ORIENTATION:
 COMPUTER MAY BE MOUNTED IN ANY POSITION

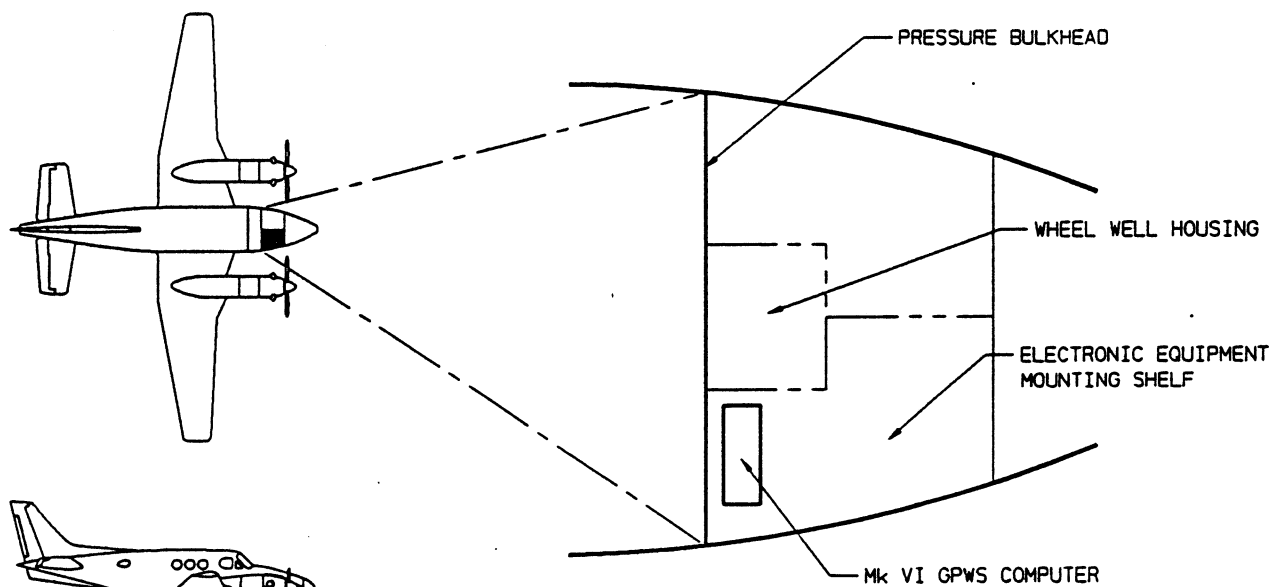
I/O CONNECTOR INFO:

LRU CONNECTOR: J1 REF
 D - SUBMINIATURE (HI DENSITY) MALE
 78 PIN CONTACT - SIZE 22
 VIBRATION LOCKING SYSTEM

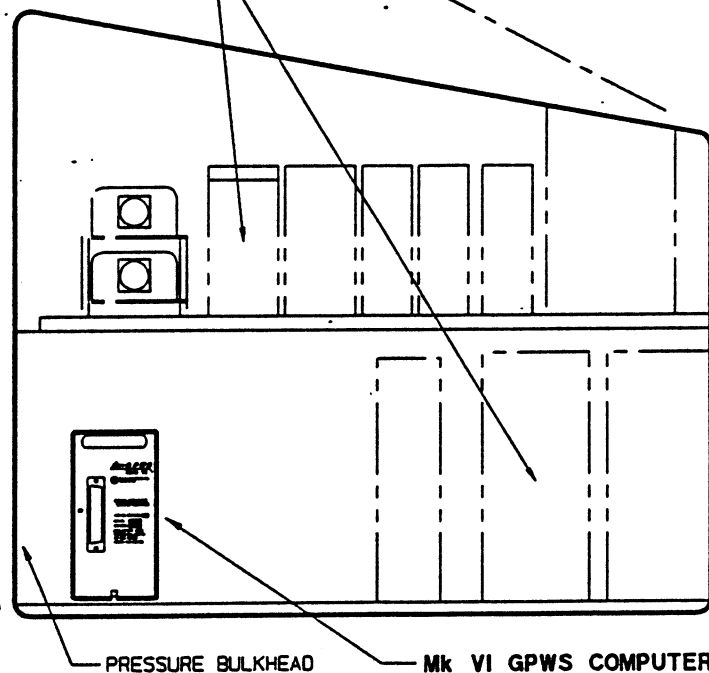
A/C CONNECTOR: (MATING - P1) (CRIMP)
 COMM EQUIV TO MIL PN M24308/2-15F
 POSITRONICS PART NO. DD78F10LVLC-15
 (INCLUDES: CONN, CONTACTS, HOOD & SLIDE LOCK)

INSTALLATION:

MOUNTING RACK:
 BENDIX / KING PART NO.
 071-04003-0002



EXISTING AVIONICS



TYPICAL COMPUTER LOCATION

(AREA SHOULD BE SUITABLE FOR AVIONICS)

SUNDSTRAND
AEROSPACE
RENO, WASHINGTON 92573-9701 SUNDSTRAND CORPORATION

11. Mating Connector (Aircraft Side)

The interface connector to the Mk VI GPWS Computer is a standard, D-Subminiature 78 pin, High Density Series connector. This connector type was chosen because of its reliability, versatility, availability and low cost. The style of anti-vibration feature selected by Sundstrand (based on survey of Part 135 users & airframe companies) is the Slide Lock system.

The mating connector (P1 - Aircraft side) is the crimp wire termination type connector. The contact size is 22 and will accommodate wire size from 22 AWG to 28 AWG. The part number of the basic connector is the commercial equivalent to Mil Spec M24308/2-15F. Sundstrand recommends that Positronics PN DD78F10LVLC-15 be purchased as a kit from the manufacturer because it includes the connector, hood, contacts (Mil) and the slide lock mechanism. Refer to page 15 for additional connector ordering information. See Figure 2 below for illustration of this connector:

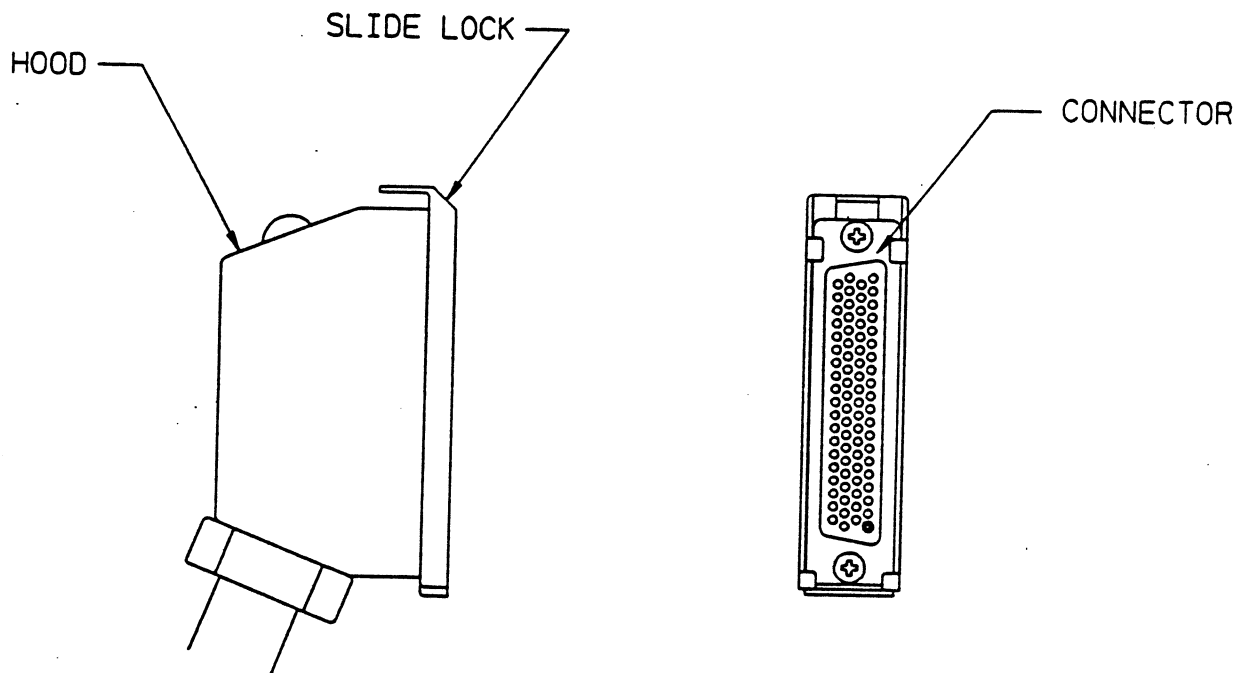


Figure 2

If availability of this connector kit part number is unacceptable, then the connector may be purchased from another vendor, such as AMP, Cannon or Souriau. However, the Hood and Slide Lock do need to be purchased from Positronics. Their part numbers are as follows:

Plastic Hood	Positronics PN D50000L00
Slide Lock	Positronics PN D500000VL0

If the customer/installer chooses, a different type of locking system, such as jackscrews, may be used for their Mk VI GPWS computer. This is done by removing the two screws that presently secure two locking tabs to the connector mounted on the Mk VI GPWS Computer. These screws are secured by locking press nuts on the back side of the connector plate, so there will be no loose nuts once the two front screws are removed. These screws and locking tabs may then be replaced with two fixed female jackscrews.

Note: When ordering connectors other than the Positronics kit PN shown above, or spare loose contacts, it is recommended that Mil Spec quality contacts (50u Gold over Nickel) be used for better reliability and durability.

Contact Part Number is Mil Spec M39029/57-354

Recommended Tools:

Hand Crimping Tool

Positronics Part Number 9507

Daniels Part Number AFM8

Military Part Number M22520/2-01

Contact Positioner

Positronics Part Number 9502-3

Daniels Part Number 9502-5 (for 20 to 30 AWG).

Daniels Part Number 9502-11 (for 18 AWG)

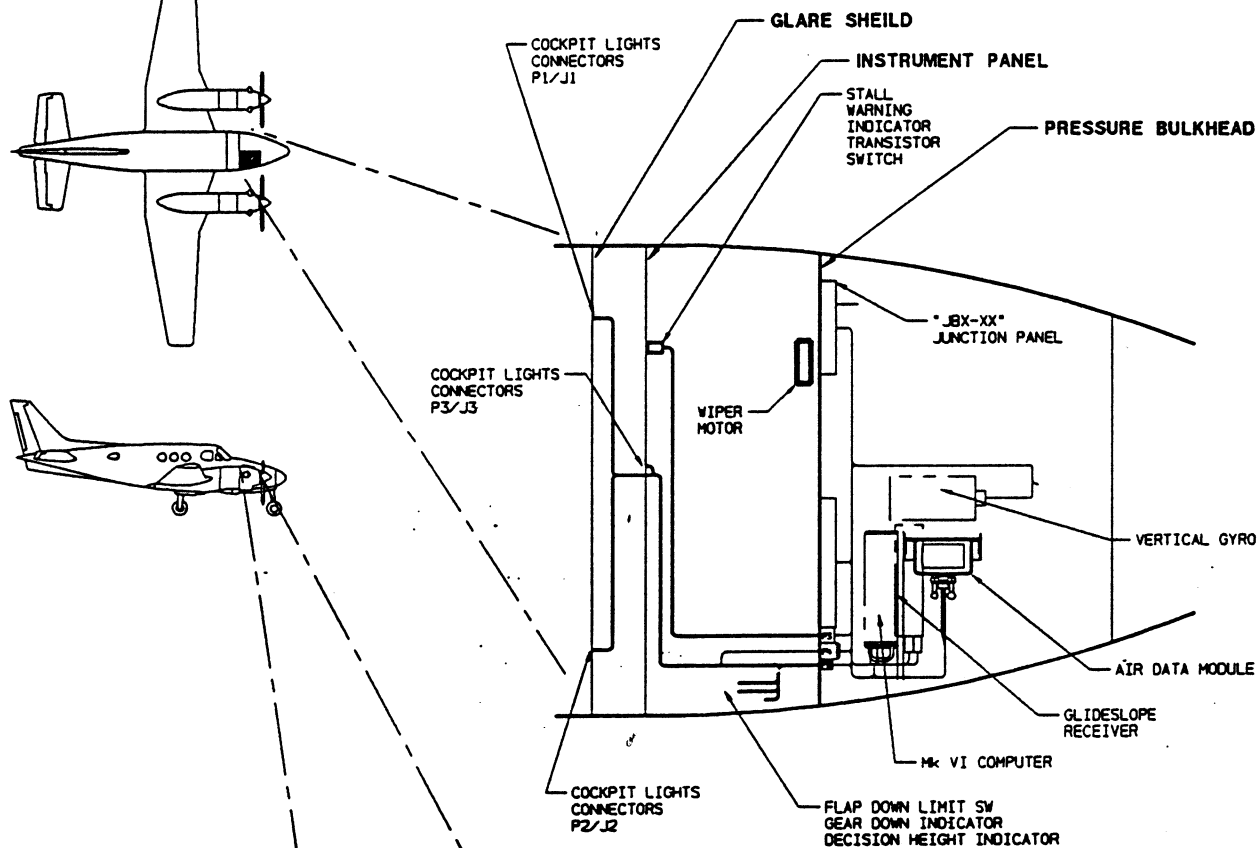
Insertion/Removal Tool

Daniels Part Number DRK 95-22MA (for pin extraction)

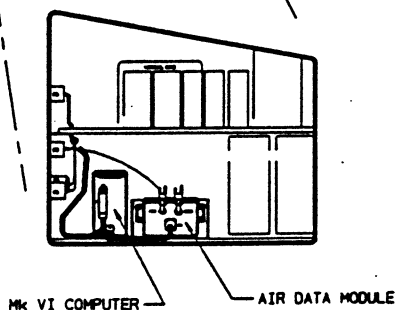
Daniels Part Number DAK 95-22MA (for pin insertion)

Military Part Number M81969/1-04

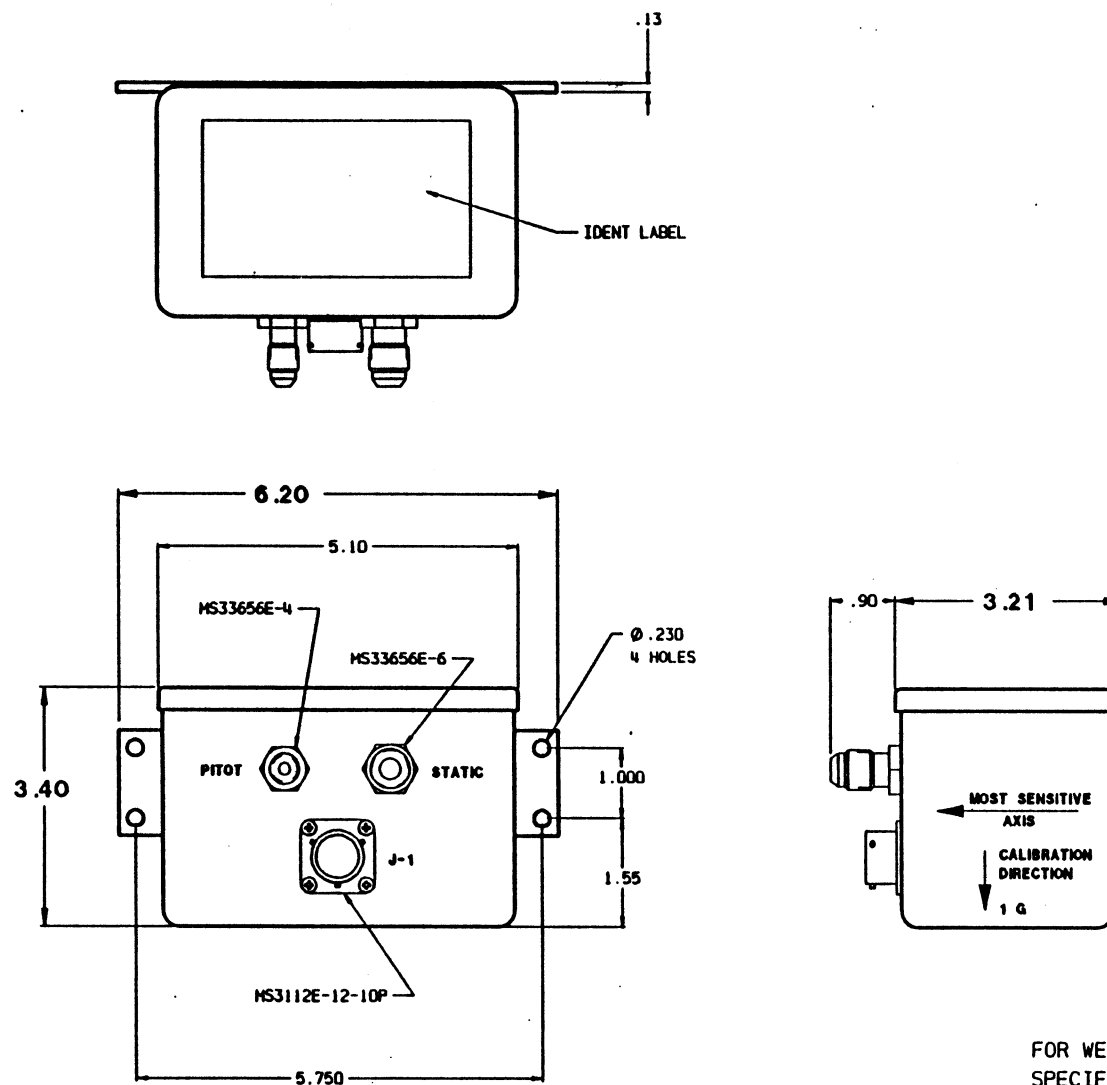
(for both insertion and extraction)



ALL WIRING SECURED TO AVOID EXCESSIVE DROOP AND INTERFERENCE AND CHAFING; DRIP LOOPS AT CONNECTORS AND TERMINAL BLOCKS, PER AC43.13-1A/1A.



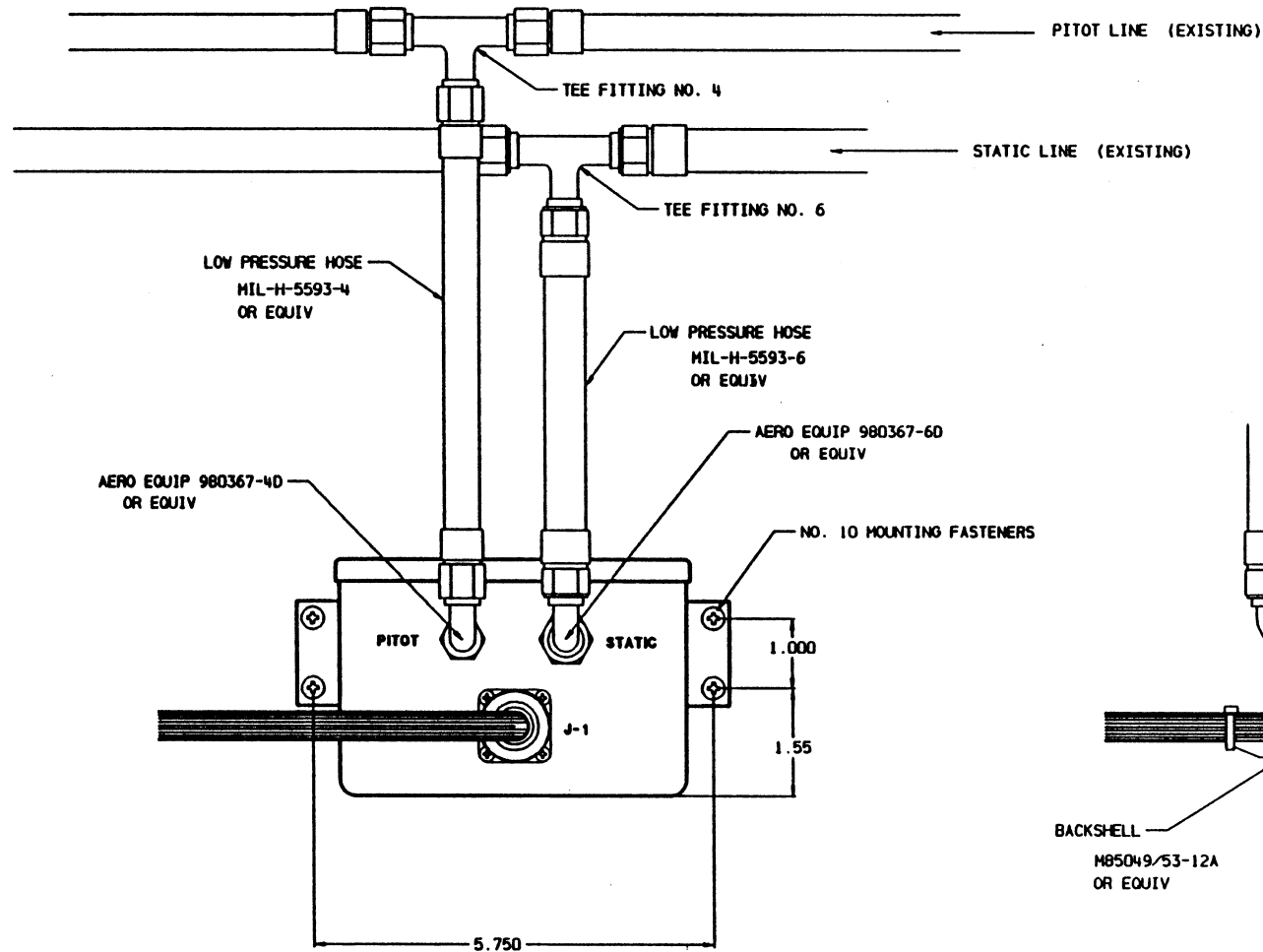
SAMPLE - TYPICAL INSTALLATION



FOR WEIGHT AND ELECTRICAL POWER
SPECIFICATIONS REFER TO THE CIC
PRODUCT DESCRIPTION DOCUMENT AND
INSTALLATION MANUAL.

AIR DATA UNIT OUTLINE

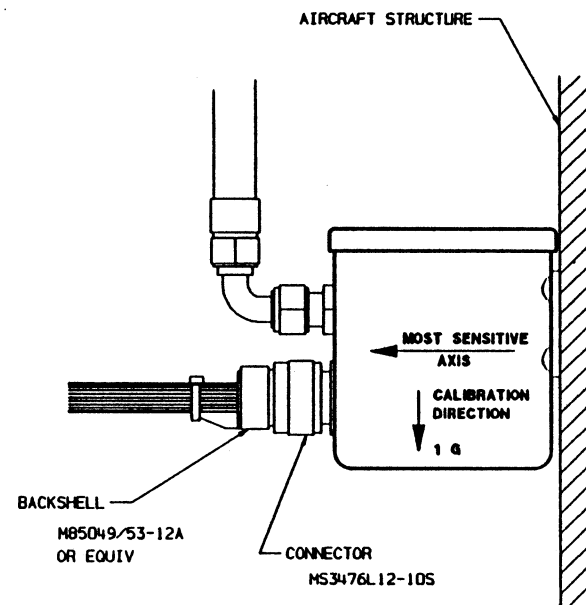
COMPUTER INSTRUMENTS CORP (CIC)
PN 04077



(AREA SHOULD BE SUITABLE FOR AVIONICS)

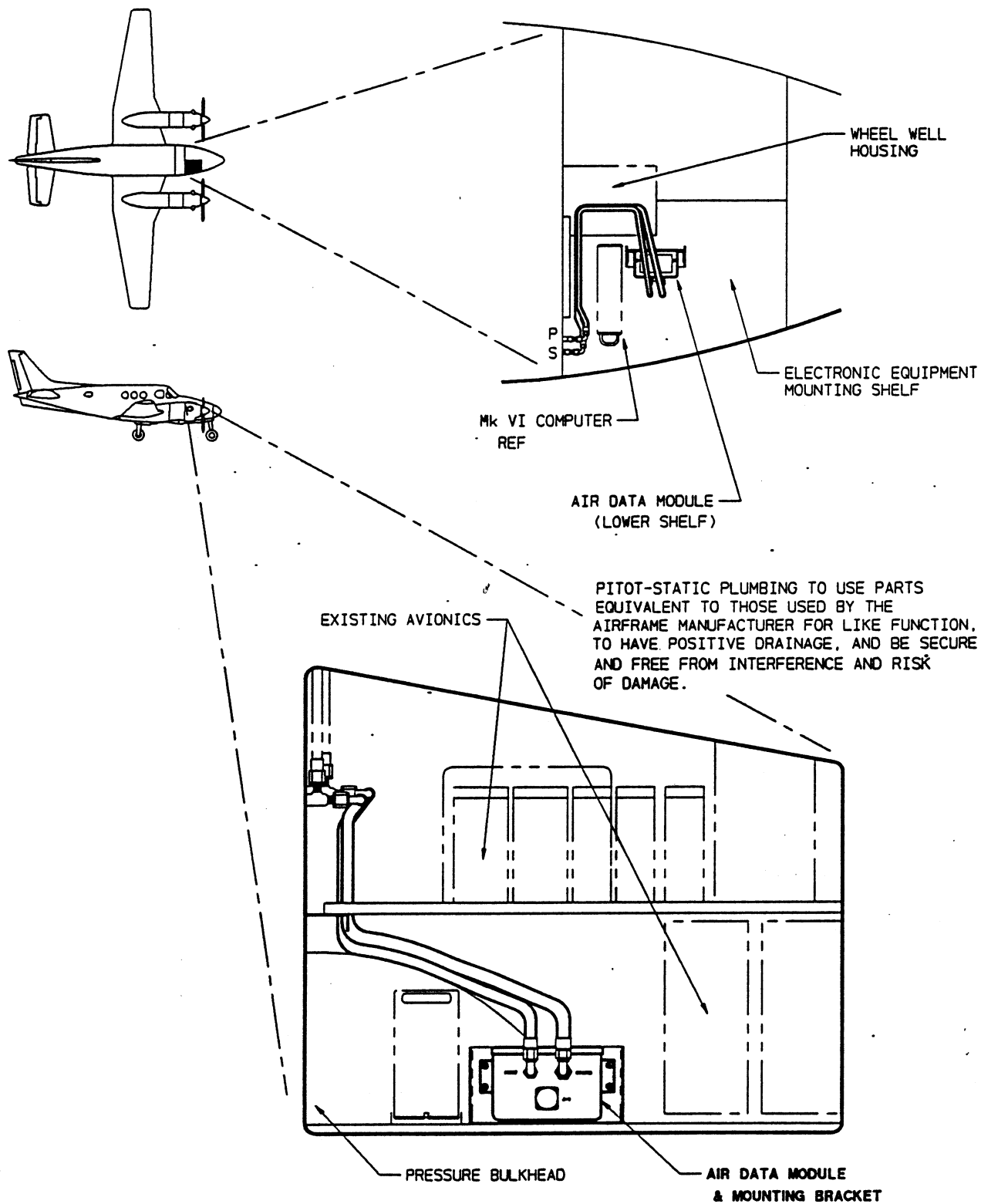
AIR DATA UNIT INSTALLATION

COMPUTER INSTRUMENTS CORP (CIC)
PN 04077



OUTBOARD

VIEW
LOOKING
FORE/AFT (FUSELAGE)



SAMPLE - TYPICAL INSTALLATION

(AREA SHOULD BE SUITABLE FOR AVIONICS)

SUNOSTRAND 

RENO, NEVADA 89502-7701 SUNOSTRAND CORPORATION

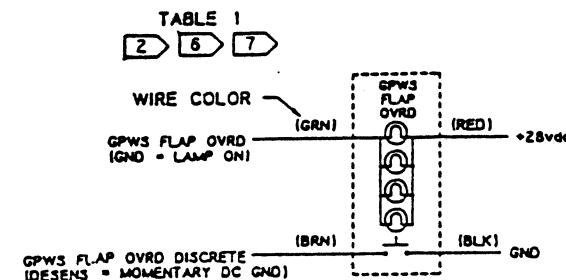
NOTES:

- 1 THIS UNIT IS AN INDICATOR ONLY.
- 2 LEGENDS HAVE WHITE VISABLE CHARACTERS ON OPAQUE BACKGROUND WHEN NOT ILLUMINATED.
- 3 ALL WIRE TO BE 22 GAUGE. (M22759/11-22 OR EQUIV) SEE WIRE DIAGRAM FOR COLOR AND WIRE DESTINATION.
- 4 EACH UNIT CONTAINS (4) T-1 BASED LAMPS P/N OL6839AS15-297 (OSHINO) RATED FOR 28VDC @ .024 AMPS PER LAMP. LIFE HOURS = 16,000.
5. RELAMP (PULLOUT) FORCE 3 - 4 lbs.
- 6 MAIN LEGEND TEXT TO BE .150 HIGH GORTON EC. STROKE WIDTH = .012 EXCEPT GPWS FLAP OVRD LEGEND IT WILL BE .120 HEIGHT GORTON EC.
- 7 LOWER LEGEND TEXT TO BE .070 HIGH GORTON EC. STROKE WIDTH = .012
8. COLOR SPECIFICATIONS PER MIL-C-25050 (EXCEPT WCS BLUE)

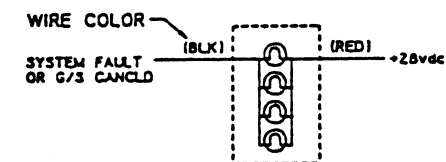
AMBER	X = .590	GREEN	X = .260	RED	X = .692	WCS BLUE	X = .275
	Y = .410		Y = .540		Y = .310		Y = .385
9. SWITCH LOAD RATINGS AT 28vdc @ 25K CYCLES (GOLD CONTACTS PER MIL-S-8805/94).

	SEALEVEL	50K FEET
RESISTIVE	2 AMP	2 AMP
INDUCTIVE	0.5 AMP	0.2 AMP
10. WEIGHT -001, -003: .20 lbs. MAX
WEIGHT ALL SINGLE UNITS .06 lbs. MAX
WEIGHT -006, -009 .50 lbs. MAX
- 11 SINGLE STATION PANEL MOUNT UNITS (-004, AND -005) WIRED WITH COLORS AS SHOWN.
- 12 SWITCH GUARD WCS P/N 80-81402-1 WILL BE SUPPLIED WITH 90-81401-006 (GPWS FLAP OVRD) SEE SWITCH GUARD DETAIL. NOTE: GUARD MAY ALSO BE PURCHASED SEPERATELY AS A SPARE.
- 13 SWITCH GUARD WCS P/N 80-81402-2 WILL BE SUPPLIED WITH 90-81401-008, AND 90-81401-009 FOR INSTALLATION OVER THE GPWS FLAP OVRD POSITION. NOTE: GUARD MAY ALSO BE PURCHASED SEPERATELY AS A SPARE.
- 14 LOCKING SLEEVE DESIGNED TO LOCK ONTO PANELS WITH A THICKNESS OF .062 TO .187. DEPENDING WHICH NOTCHES LOCATED ON SLEEVE ARE SELECTED.
- 15 REVISION E CHANGED NOMENCLATURE AND COLOR OF LEGEND TO "GPWS FLAP OVRD" COLOR BLUE. FROM "GPWS DESENS" COLOR GREEN.

NOMENCLATURE	ILLUM. BKND COLOR	LTR COLOR	LEGEND PART NO 90-81402
GPWS P/TEST	RED	WHITE	-001
GPWS FLAP OVRD	BLUE	WHITE	-006
BELOW G/S P/CANCEL	AMBER	WHITE	-003
GPWS INOP	AMBER	WHITE	-004
G/S CANCLD	AMBER	WHITE	-005

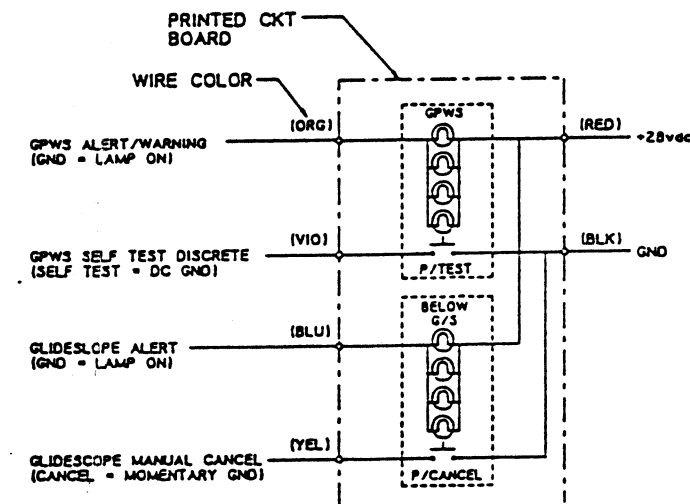


WIRE DIAGRAM
TYP FOR -006

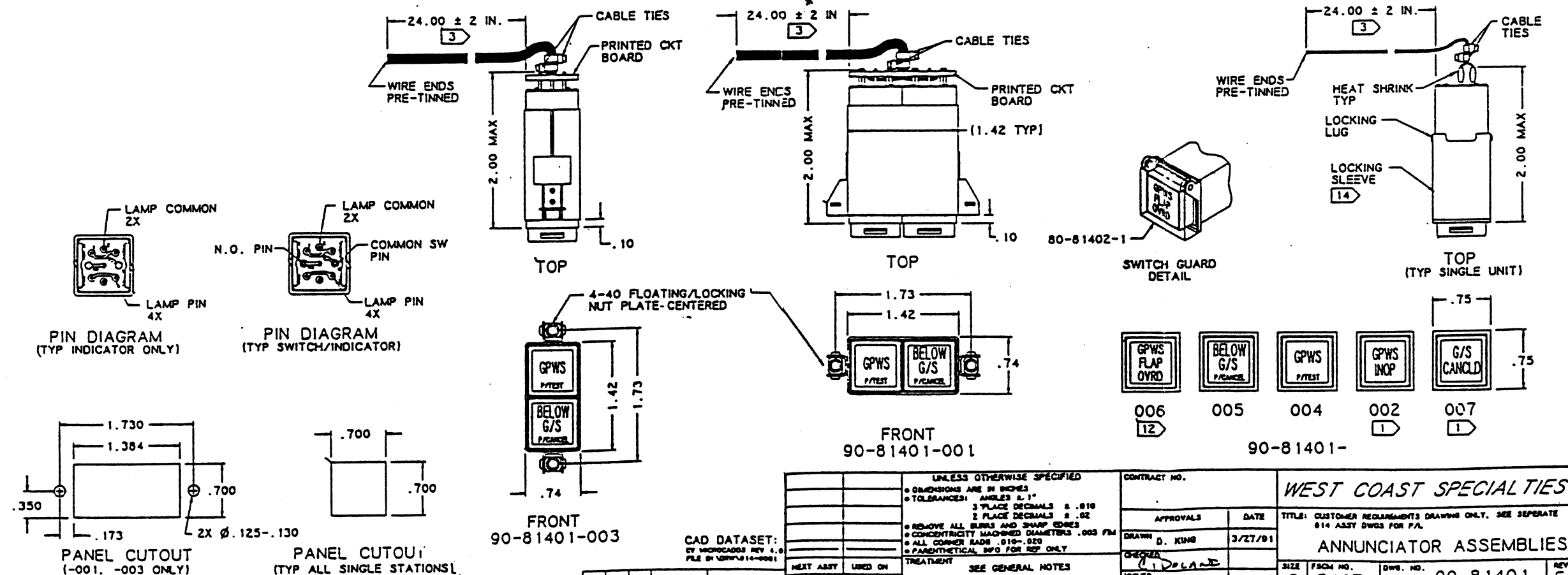


WIRE DIAGRAM
TYP FOR -002, AND -007

REVISIONS			
REV	DESCRIPTION	DATE	APPROVED
A	RELEASE TO PRODUCTION	11/11/91	S.B.
B	ADDED PIN NUMBERS TO WIRE DIA.	12/2/91	S.B.
C	DWG CLARIFICATION	1/29/92	S.B.
D	SW. GUARD P/N ADDED (-006, -009)	9/1/92	S.B.
E	REVISED NOMENCLATURE -006 UNIT	11/20/92	S.B.
F	ADDED -101 THRU -103 SHEET 3	1/14/93	C.H.



WIRE DIAGRAM
TYP FOR -001, -003
(ALSO SINGLE UNITS -004, -005)



CAD DATASET:
BY MICROCAD REV 4.0
FILE IN C:\WP51\90-81401-0001

F	E	F	REVISION	REV STATUS OF SHEETS
3	2	1	SHEET	

UNLESS OTHERWISE SPECIFIED			
• DIMENSIONS ARE IN INCHES			
• TOLERANCES: ANGLES ± 1°			
3 PLACE DECIMALS ± .010			
2 PLACE DECIMALS ± .02			
• REMOVE ALL BURRS AND SHARP EDGES			
• CONCENTRICITY MACHINED DIAMETERS .005 PM			
• ALL DIMENSIONS .010-.020			
• PARENTHESES FOR REF ONLY			
TREATMENT			
SEE GENERAL NOTES			
FINISH			
SEE GENERAL NOTES			
DO NOT SCALE DRAWING			

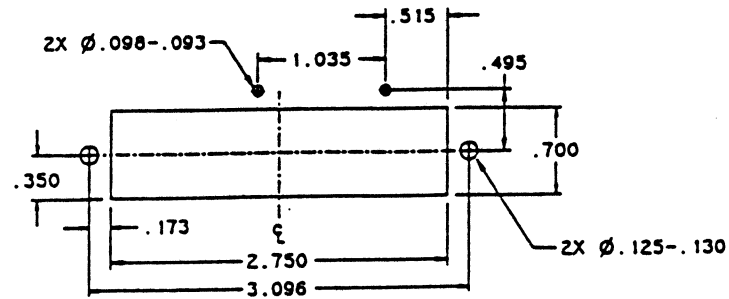
WEST COAST SPECIAL TIES

TITLE: CUSTOMER REQUIREMENTS DRAWING ONLY. SEE SEPARATE 014 ASST DWGS FOR P.A.

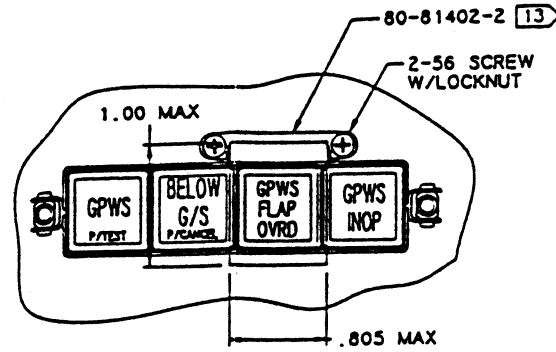
ANNUNCIATOR ASSEMBLIES

SIZE	FSOM NO.	DWG. NO.	REV
C	51074	90-81401	F
SCALE	1/1	SHEET	1 OF 3

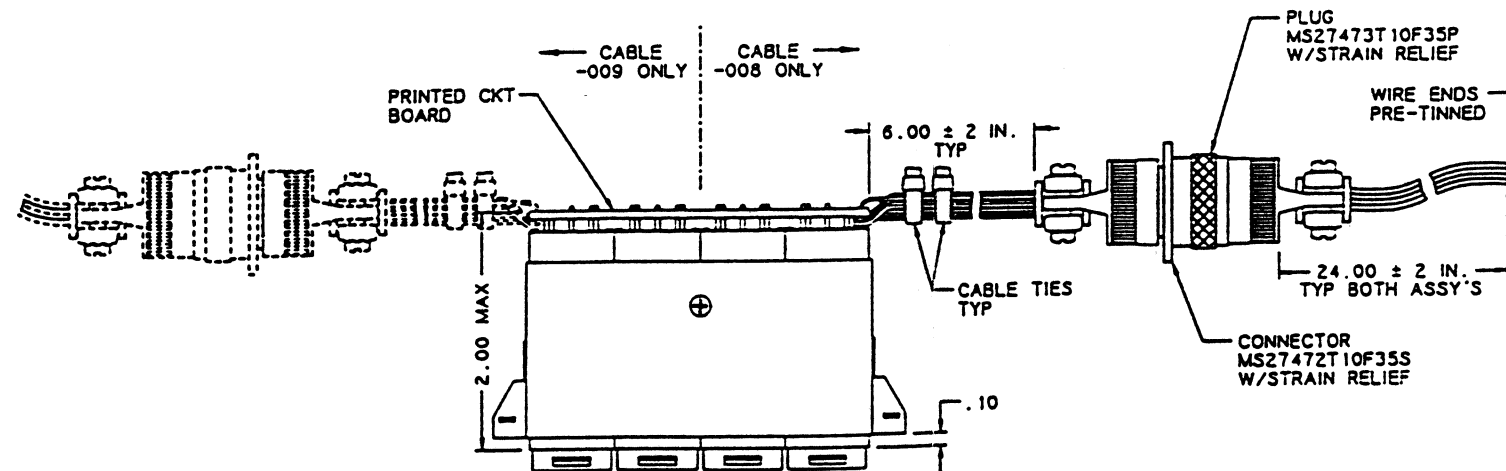
REVISIONS			
REV	DESCRIPTION	DATE	APPROVED
E	SEE SHT 1 FOR DESCRIPTION		



PANEL CUTOUT
(-008, -009 ONLY)



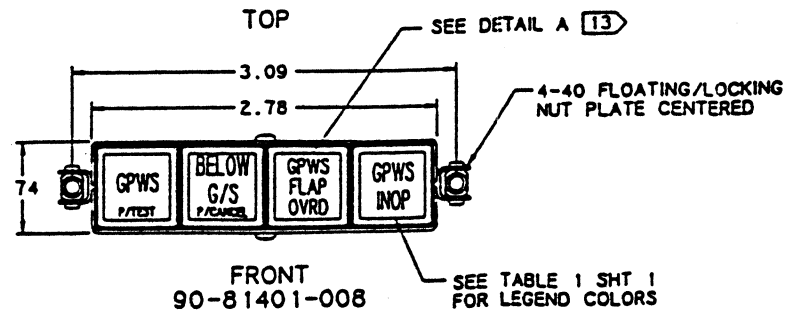
DETAIL A
(SWITCH GUARD INSTALLED)



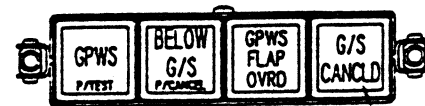
TOP



SIDE
CONN. NOT SHOWN

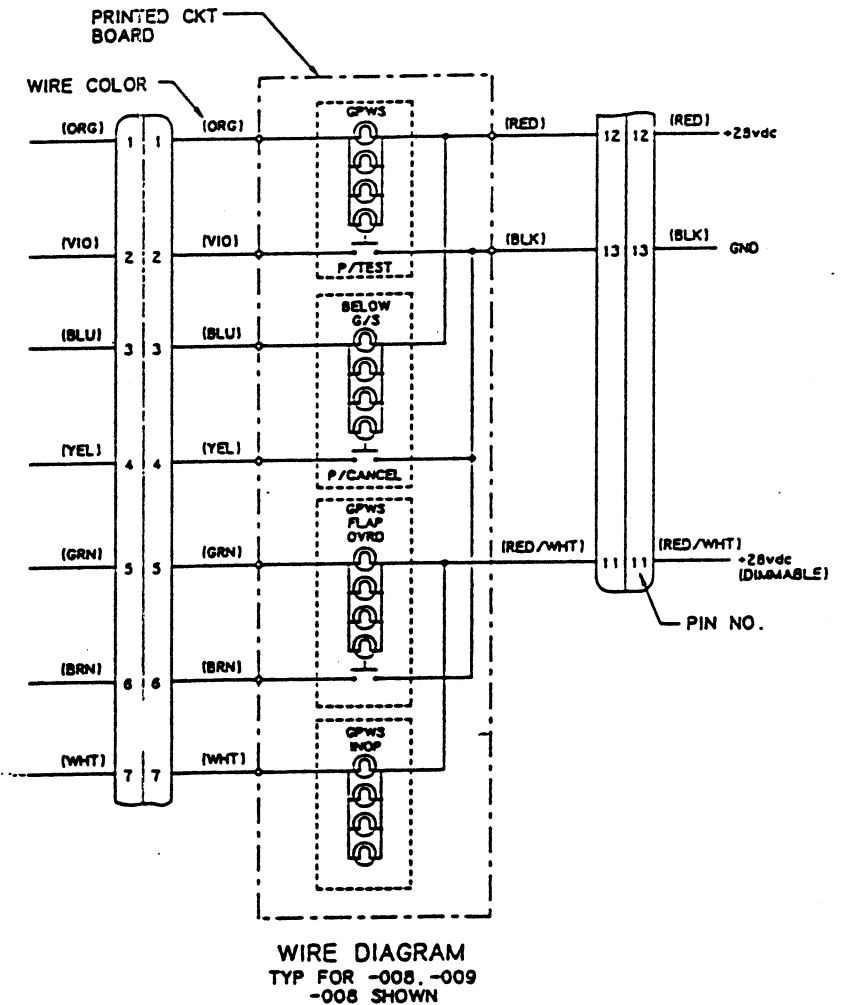


FRONT
90-81401-008



FRONT
90-81401-009

-009 SAME AS -008
EXCEPT LEGEND G/S CANCLD
ALSO CABLE PIGTAIL IS STRAIN
RELIEFED ON LEFT SIDE OF ASSY.



WIRE DIAGRAM
TYP FOR -008, -009
-008 SHOWN

CAD DATASET:
CY MICROCADS REV 4.0
FILE IS: 90-81401-0002

WEST COAST SPECIALTIES		(CUSTOMER REQUIREMENTS AND INTERFACE DWG. ONLY)		
DATE	SIZE	FSCM NO.	DWG. NO.	REV
0. KING	11/4/91	C	51074	90-81401
ISSUED	SCALE FULL			SHEET 2 OF 3

NOTES:

A (P/TEST) AND (P/CANCEL) TEXT TO BE WHITE, VISABLE IN ALL CONDITIONS. ALL OTHER TEXT WILL BE RED IN COLOR WHEN ILLUMINATED AND NOT VISABLE IN THE NON-ILLUMINATED STATE.

REVISIONS			
REV	DESCRIPTION	DATE	APPROVED
F	SEE SHT 1 FOR DESCRIPTION		

XXXX
XXXX
XXXX
STYLE DETAIL A
TWO ROWS TEXT
BOTH ROWS .150 HEIGHT

XXXX
XXXX
XXXX
STYLE DETAIL D
THREE ROWS TEXT
ALL ROWS .120 HEIGHT

XXXX
XXXX
XXXX
STYLE DETAIL B
TWO ROWS TEXT
TOP ROW .150 HEIGHT
BOTTOM ROW .070 HEIGHT

XXXX
XXXX
XXXX
STYLE DETAIL E
SPLIT LEGEND 2-WAY
BOTH ROWS .150 HEIGHT

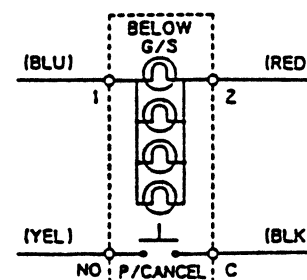
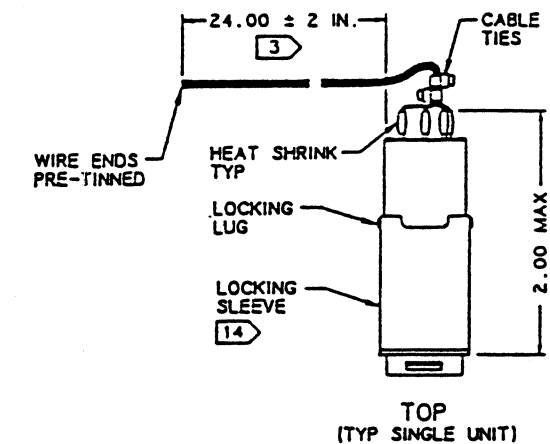
XXXX
XXXX
XXXX
STYLE DETAIL C
THREE ROWS TEXT
TWO ROWS .150 HEIGHT
ONE ROW .070 HEIGHT

XXXX
xx xx
STYLE DETAIL F
SPLIT LEGEND 3-WAY
ALL ROWS .090 HEIGHT

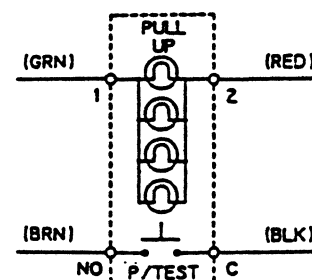
ALL TEXT FONT TO BE US BLOCK ENGRAVED (EQUIVALENT TO GORTON)
AND WILL HAVE A STROKE WIDTH OF APPROX .012

STYLE DETAIL	90-81402	NOMENCLATURE	ILLUMINATED TXT. COLOR	ILLUMINATED BKG. COLOR	SPECIAL NOTES
C	-101	BELOW G/S P/CANCEL	RED	OPAQUE	A
C	-102	PULL UP P/TEST	RED	OPAQUE	A
F	-103	VLF SX MSG WPT	AMBER	OPAQUE	

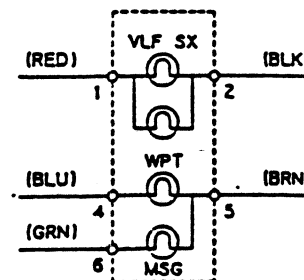
(COLOR SPECIFICATIONS PER NOTE 8 ON SHEET 1 OF THIS DWG.)



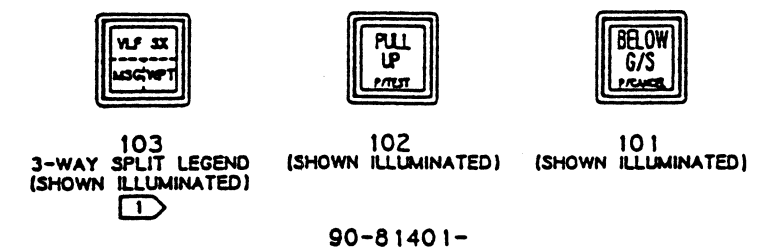
WIRE DIAGRAM
(TYP FOR -101)



WIRE DIAGRAM
(TYP FOR -102)



WIRE DIAGRAM
(TYP FOR -103)



90-81401-

WEST COAST SPECIALTIES		(CUSTOMER REQUIREMENTS AND INTERFACE DWG. ONLY)		
CAD DATASET:	SIZE	FSCM NO.	DWG. NO.	REV
CV MICROCADS REV 4.0 FILE IN C:\WP51\14-00003	D. KING	11/14/83	C 51074	90-81401 F
SCALE FULL		SHEET 3 OF 3		

17. Cockpit Lights - Description and Location

This section provides information and recommendations for selecting, locating and mounting of the Mk VI GPWS System Cockpit Lights. Following is a description of each light:

Description:

GPWS Alert/Warning "GPWS" - "P/TEST"

This assembly is illuminated with red background and activated during any Mode 1 thru Mode 4 Alert or Warning, until the warning envelope is exited. This assembly also includes a depressable switch. By pressing and holding this light/switch, the Mk VI GPWS can be tested whenever the aircraft is on the ground. This Self-Test is not functional while in the air.

Glideslope Alert "BELOW G/S" - "P/CANCEL"

This assembly is illuminated with amber background and activated during any Mode 5 Alert, until the warning envelope is exited. This assembly also has a depressable switch. During an approach, the pilot may press this light/switch which manually cancels the Mode 5 warnings (i.e. for intentionally low approaches) and avoids an unwanted warning. This feature is automatically disabled and resets to normal after descending below 50 feet AGL or climbing above 1900 feet AGL, by deselecting the ILS frequency, or by pressing this light/switch again.

Glideslope Cancelled "G/S CANCLD"

-Optional- This annunciator is illuminated with amber background and is activated after any flight crew has initiated the manual cancellation of Mode 5 by pressing the "BELOW G/S - P/CANCEL" light/switch as described above.

GPWS Flap Override "GPWS FLAP OVRD"

-Optional- This guarded light/switch assembly is illuminated after either pilot has initiated the manual selection of the GPWS Flap Override feature. The assembly will be illuminated with blue background and serves to remind the flight crew that this feature has been selected. Note: This light color may also be white background instead of blue, or black background with white legend. Colors per FAR 23.1322.

System Validity "GPWS INOP"

This annunciator is illuminated with amber background and is activated during any detected partial or total failure of the Ground Proximity Warning System.

NOTES: All Lights

1. Refer to Sundstrand Product Specification Number 965-0686-601 for additional information and for Electrical Loads specifications.

2. No lights are flashing.
3. All Lights are Sun Light Readable.
4. In the "OFF" condition, all lights have black background with visible white nomenclature.
5. If desired, the "GPWS FLAP OVRD", the "GPWS INOP" and the "G/S CANCLD" light may be put on a "dimmer" circuit for night operation. Do NOT put the "GPWS" or the "BELOW G/S" light on a "dimmer" circuit.
6. Lamp replacement information:
 - +28 VDC Size - T1
 - Replaceable from the front
 - ANSI - Industry Std Part No. 6839 AS15-297
 - Available from: WAMCO - Fountain Valley, Ca 92708, (714) 545-5560
 - Sources: Oshino, Chicago Miniature, ETC.

Location

Cockpit layout, size and operator's preference will determine if only one set of lights is used (i.e. mounted in the center), or if dual sets are used (one set on each side), or a combination thereof is desired. The following are recommended locations:

"GPWS" & "BELOW G/S"

Should be located together and in the Flight Crew's "Primary Field of View".
This would include either the instrument panel or the edge of the glareshield.

"GPWS FLAP OVRD" -Optional-

Should be located in flight crew's - Field of View and within reach of both crew members. This light/switch may be shared or located with the "GPWS" and "BELOW G/S" lights.

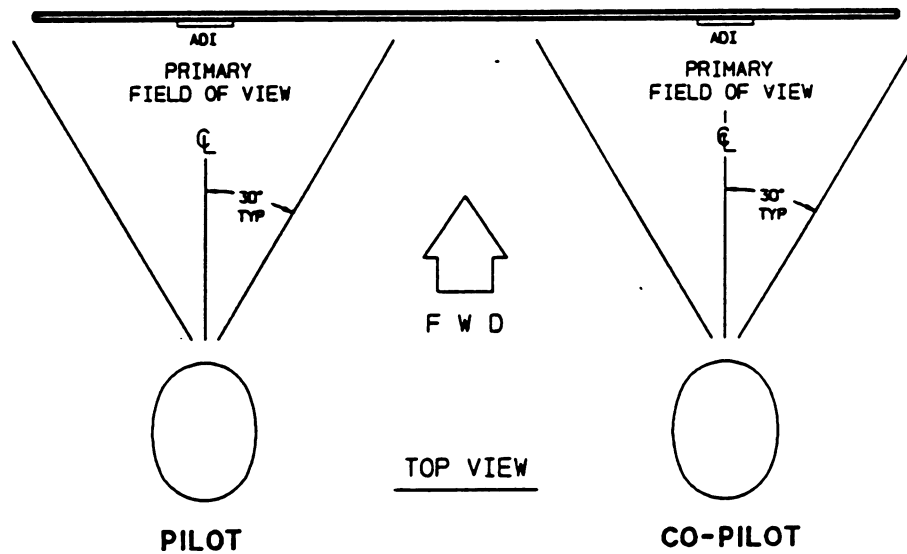
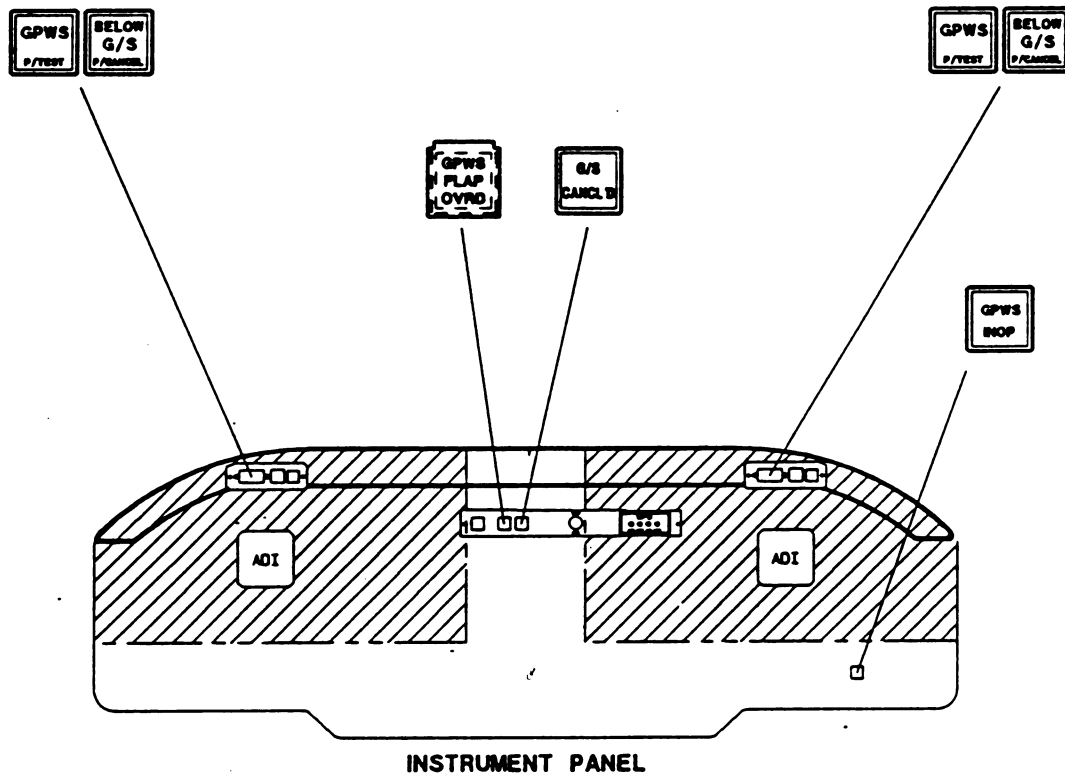
"GPWS CANCLD" -Optional- .

If used, this light should be located within at least one flight crew member's Field of View.

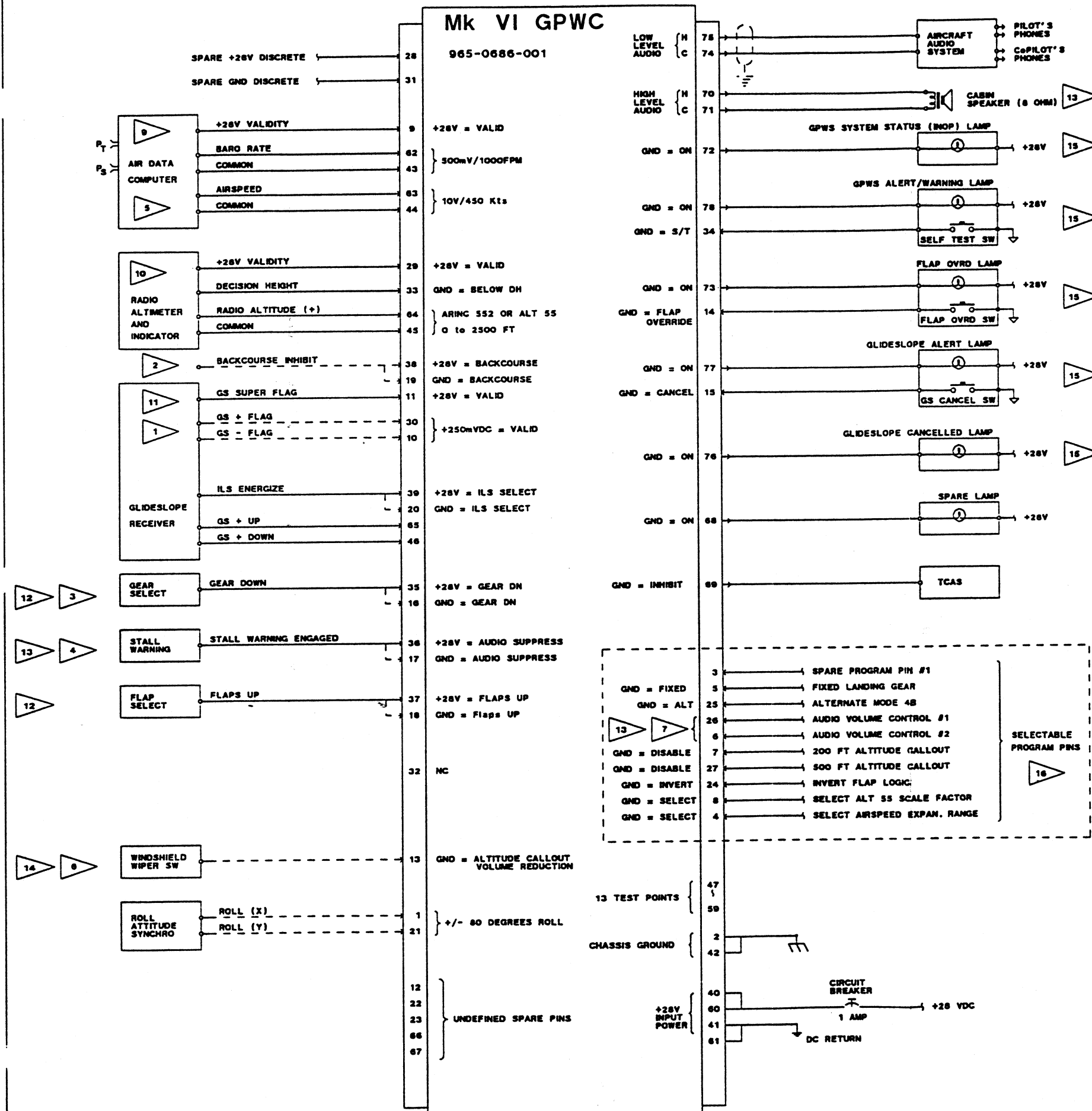
"GPWS INOP"

This light should be located in view of at least one flight crew member or with other system INOP lights of similar importance. It is recommended that this light not be located in the Flight Crew's "Primary Field of View". Reason being that in the event of a GPWS system failure at the beginning of a flight, this light will remain "ON" until the problem is fixed.

For typical Cockpit Light locations, see the following illustrations:



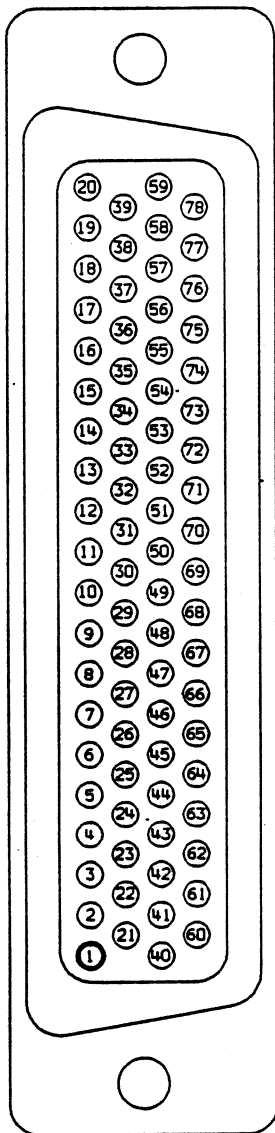
SAMPLE - TYPICAL INSTALLATION



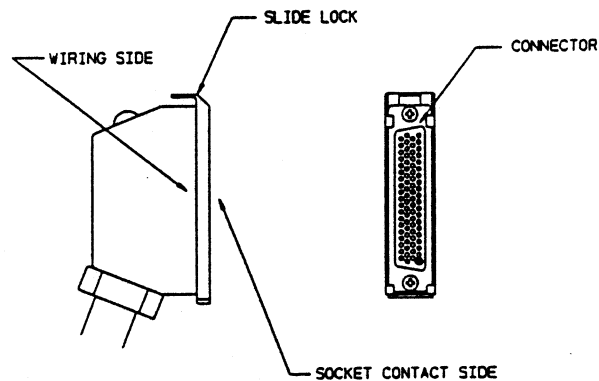
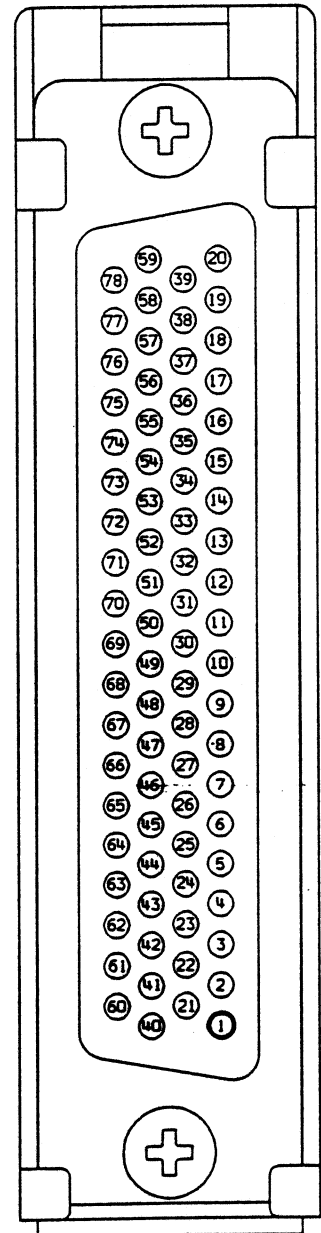
FLAG NOTES:

- +28V VALIDITY OR LOW LEVEL VALIDITY REQUIRED.
- BACKCOURSE DISCRETE OPTIONAL.
- AIRSPEED SWITCH USED FOR NON-RETRACTABLE GEAR.
- SIGNAL SOURCE FROM FLIGHT CREW, STALL WARNING OR OTHER SYSTEM. WHEN ACTIVE THIS DISCRETE SUPPRESSES THE AUDIO OUTPUT, LEAVING THE ALERT/WARNING LAMPS ON.
-
- IF WINDSHIELD WIPER IS OFF, THEN DC GROUND AT PIN 13. IF WINDSHIELD WIPER IS ON, THEN +28V AT PIN 13.
- | PIN 26 | PIN 6 | AUDIO LEVEL |
|--------|--------|------------------|
| GROUND | GROUND | 1/2 WATT |
| GROUND | OPEN | 1 WATT |
| OPEN | OPEN | 2 WATTS (NORMAL) |
| OPEN | GROUND | 4 WATTS |
- MATING CONNECTOR M24308/2-15
POSITRONICS DD78F10LVLC-15
= 22 GAUGE WIRE UNLESS OTHERWISE NOTED.
- SEE PAGE 43, 44 FOR OPTIONS.
- SEE PAGE 41, 42 FOR OPTIONS.
- SEE PAGE 45 FOR OPTIONS.
- SEE PAGE 47 FOR OPTIONS.
- SEE PAGE 48 FOR OPTIONS.
- SEE PAGE 49 FOR OPTIONS.
- SEE PAGE 50 FOR OPTIONS.
- SEE PAGE 51 FOR OPTIONS.

WIRING SIDE



SOCKET CONTACT SIDE



MATING CONNECTOR

PIN ARRANGEMENT

20. I / O Connector - Pin / Signal Identification

NOTE: (Refer to Sundstrand Product Spec No. 965-0686-601 for tolerances on voltages and grounds, and current limits information.)

Pin No.	Signal
1.	Roll Attitude Synchro: (X)
2.	Chassis Ground
3.	Spare # 1 Program Pin
4.	Alternate Airspeed Expansion Range - Program Pin: Alternate = DC Ground
5.	Fixed Landing Gear/Float Aircraft - Program Pin: Fixed = DC Ground
6.	Audio Volume Control # 2 Program Pin: Select = DC Ground Note: Refer to page 48 for Nominal selected Audio Volume
7.	200 Foot Altitude Callout Disable - Program Pin: Disable = DC Ground
8.	Radio Altimeter Scale Factor Select - Program Pin: ALT 55 = DC Ground
9.	Barometric Altitude Rate Validity: + 28 VDC
10.	Glideslope Deviation Low Level Validity: Signal Return
11.	Glideslope Deviation Validity: + 28 VDC
12.	Spare Connector Pin
13.	Altitude Callouts Volume Reduction Discrete: Reduced Volume = DC Ground
14.	GPWS Flap Override Discrete: Flap Override = Momentary DC Ground
15.	Glideslope Manual Cancel Discrete: Cancel = Momentary DC Ground
16.	Landing Gear Discrete: Gear Down = DC Ground
17.	External GPWS Audio Suppression Discrete: Audio Suppression = DC Ground
18.	Landing Flap Discrete: Flaps <u>NOT</u> Landing = DC Ground
19.	ILS Backcourse Approach Selected Discrete: Backcourse = DC Ground
20.	ILS Frequency Selected Discrete: ILS = DC Ground
21.	Roll Attitude Synchro: (Y)
22.	Spare Connector Pin
23.	Spare Connector Pin
24.	Landing Flap Logic Inversion - Program Pin: Invert = DC Ground
25.	Alternate Mode 4B Threshold - Program Pin: Alt. 150 Foot = DC Ground
26.	Audio Volume Control # 1 Program Pin: Select = DC Ground Note: Refer to page 48 for Nominal selected Audio Volume
27.	500 Foot Altitude Callout Disable - Program Pin: Disable = DC Ground
28.	Spare # 1 Discrete: + 28 VDC
29.	Radio Altimeter Validity: + 28 VDC
30.	Glideslope Deviation Low Level Validity: DC Signal
31.	Spare # 1 Discrete: Ground
32.	Not Used (Do not connect to)

33. Decision Height (DH) Discrete: Below DH = DC Ground
 34. GPWS Self Test Discrete: Self Test = DC Ground
 35. Landing Gear Discrete: Gear Down = +28 VDC
 36. External GPWS Audio Suppression Discrete: Audio Suppression = + 28 VDC
 37. Landing Flap Discrete: Flaps NOT Landing = + 28 VDC
 38. ILS Backcourse Approach Selected Discrete: Backcourse = + 28 VDC
 39. ILS Frequency Selected Discrete: ILS = + 28 VDC (See page 45)
 40. Power Input: + 28 VDC
 41. Power Input: DC Ground
 42. Chassis Ground
 43. Barometric Altitude Rate Input: Signal Return (-)
 44. Airspeed Input: Signal Return (-)
 45. Radio Altimeter Input: Signal Return (-)
 46. Glideslope Deviation Input: DC Signal (+) = Above Beam = Fly Down (See
 47. Test Point # 1' Caution! Do not probe or connect to
 48. Test Point # 2 " "
 49. Test Point # 3 " "
 50. Test Point # 4 " "
 51. Test Point # 5 " "
 52. Test Point # 6' " "
 53. Test Point # 7 " "
 54. Test Point # 8 " "
 55. Test Point # 9 " "
 56. Test Point # 10 " "
 57. Test Point # 11 " "
 58. Test Point # 12 " "
 59. Test Point # 13 " "
 60. Power Input: + 28 VDC
 61. Power Input: DC Ground
 62. Barometric Altitude Rate Input: DC Signal 500mVDC / 1000 FPM
 63. Airspeed Input: DC Signal 10 VDC / 450 Knots
 64. Radio Altimeter Input: DC Signal
 65. Glideslope Deviation Input: DC Signal (+) = Below Beam = Fly Up (See pa
 66. Spare
 67. Spare
 68. Spare Lamp Output: Ground = Lamp ON
 69. TCAS II Inhibit Output: Inhibit = Ground
 70. Audio Speaker Output: Audio Signal (H)
 71. Audio Speaker Output: Signal Return (C)
 72. GPWS System Status Lamp Output: System Fault = Ground = Lamp ON
 73. GPWS Flap Override Lamp Output: Flap Override = Ground = Lamp ON
 74. Audio Low Level Output: Signal Return (C)

- 75. Audio Low Level Output: Audio Signal (H)
- 76. Glideslope Cancelled Lamp Output: Cancelled = Ground = Lamp ON
- 77. Glideslope Alert Lamp Output: Alert = Ground = Lamp ON
- 78. GPWS Alert/Warning Lamp Output: Alert/Warning = Ground = Lamp ON

**AIRCRAFT +28 VDC
MAIN (PILOT'S) ESSENTIAL BUS**

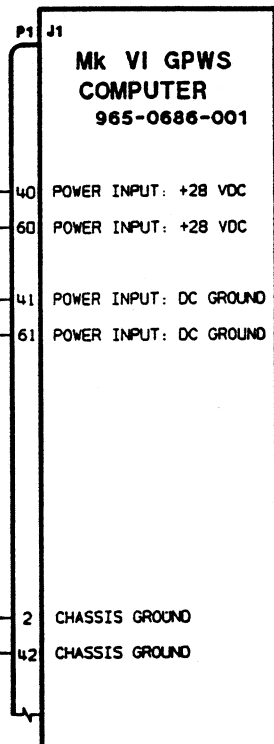
NOTE: IN ADDITION TO THE Mk VI COMPUTER,
VERIFY THAT ALL OTHER GPWS SYSTEM COMPONENTS
ARE CONNECTED TO THIS SAME BUS.

Mk VI GPWS COMPUTER
RADIO ALTIMETER
AIR DATA UNIT
GLIDESLOPE RECEIVER
FLAP POSITION LOGIC
LANDING GEAR LOGIC
VERTICAL GYRO (IF USED)
AUDIO PANEL
GPWS WARNING LIGHTS

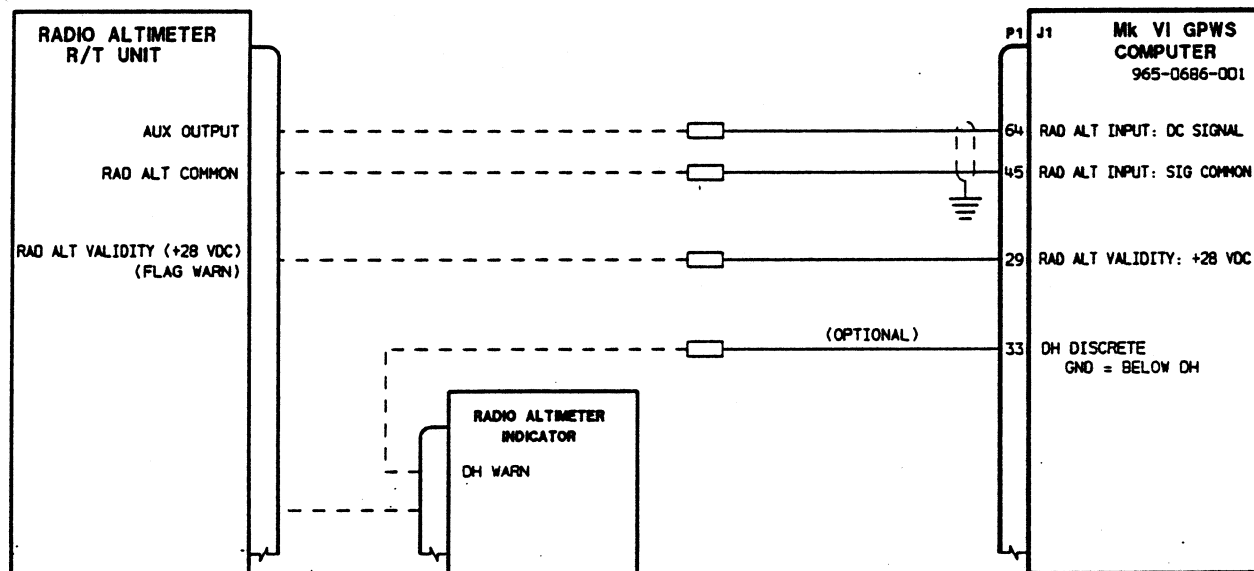
CIRCUIT BREAKER
1 AMP

AIRCRAFT
DC RETURN

AIRCRAFT
CHASSIS
GROUND



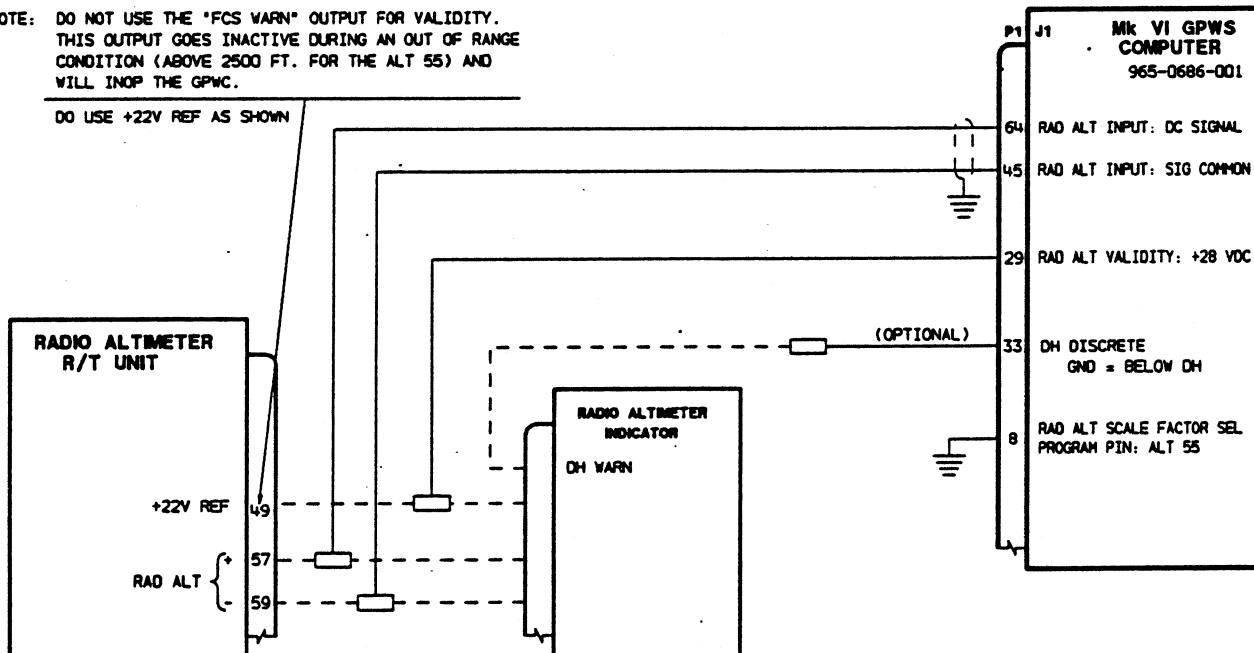
ARINC 552 TYPE INSTALLATION



COLLINS ALT 55 SERIES

NOTE: DO NOT USE THE "FCS WARN" OUTPUT FOR VALIDITY. THIS OUTPUT GOES INACTIVE DURING AN OUT OF RANGE CONDITION (ABOVE 2500 FT. FOR THE ALT 55) AND WILL INOP THE GPWC.

DO USE +22V REF AS SHOWN



GENERAL NOTES:

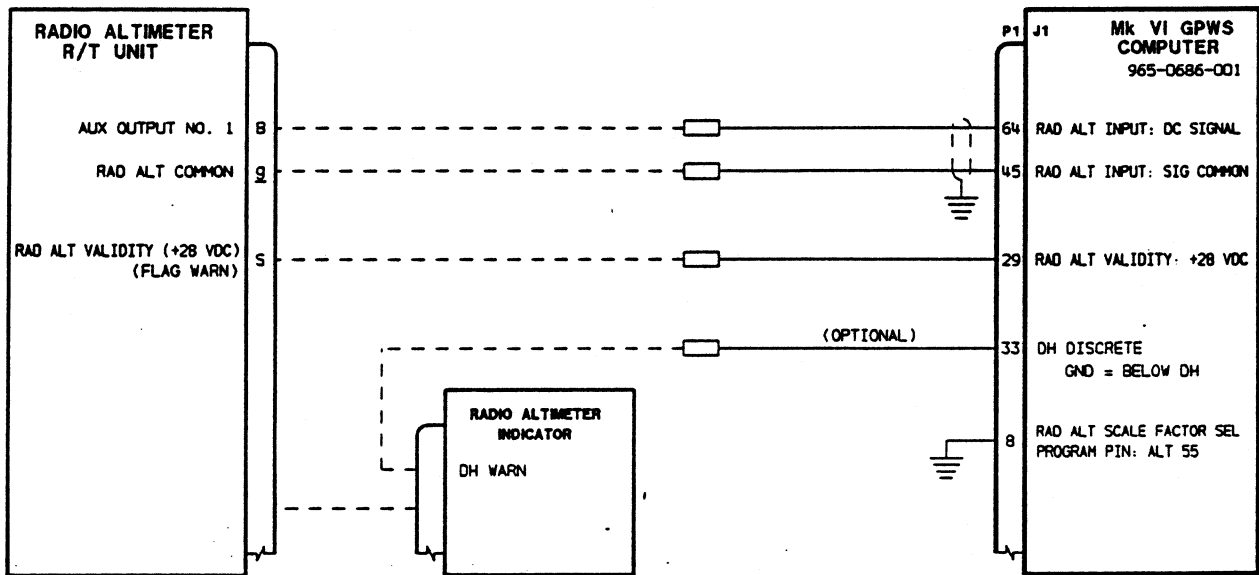
CONSULT CUSTOM AVIONICS WIRING DIAGRAMS OF INDIVIDUAL AIRCRAFT RECEIVING Mk VI GPWS INSTALLATION FOR TYPE OF AVIONIC EQUIPMENT INSTALLED & FOR WIRING TERMINATION POINTS. IN ADDITION, REFER TO MANUFACTURER'S INSTALLATION INSTRUCTIONS FOR EQUIPMENT'S PARTICULAR MODEL NO., MODIFICATIONS, AND APPLICABLE CONNECTOR PIN NO.'S.

--- = EXISTING A/C WIRING
 = JUNCTION OR SPLICE
 = DC GROUND

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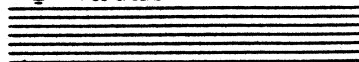
KING KRA 405



GENERAL NOTES:

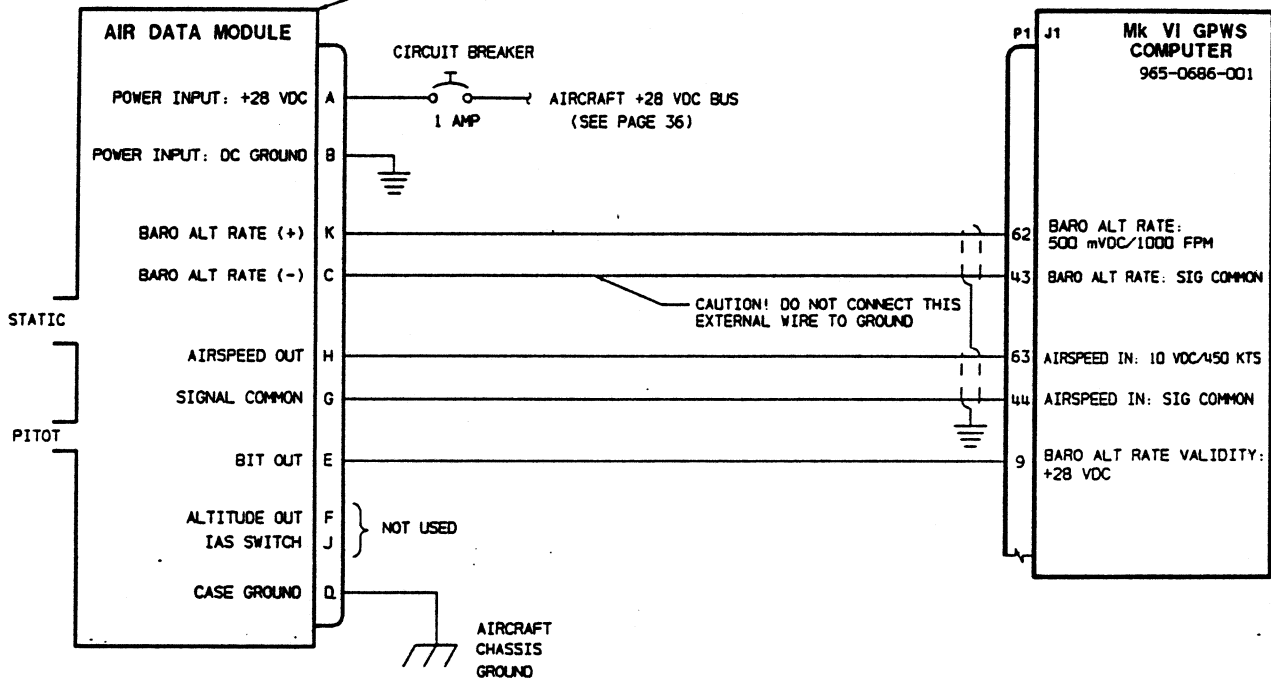
CONSULT CUSTOM AVIONICS WIRING DIAGRAMS OF INDIVIDUAL AIRCRAFT RECEIVING Mk VI GPWS INSTALLATION FOR TYPE OF AVIONIC EQUIPMENT INSTALLED & FOR WIRING TERMINATION POINTS. IN ADDITION, REFER TO MANUFACTURER'S INSTALLATION INSTRUCTIONS FOR EQUIPMENT'S PARTICULAR MODEL NO., MODIFICATIONS, AND APPLICABLE CONNECTOR PIN NO.s.

--- = EXISTING A/C WIRING
 - - - = JUNCTION OR SPLICE
 ⏏ = DC GROUND

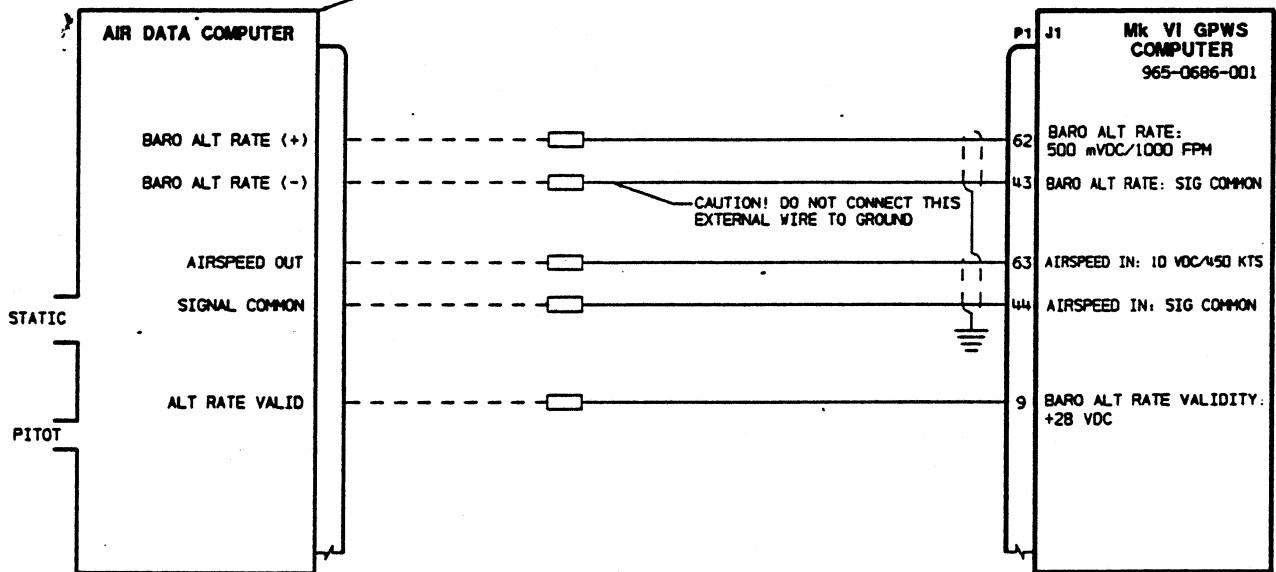


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COMPUTER INSTRUMENTS CORP - PN 04077



COLLINS ADC-65C & ADC-81A



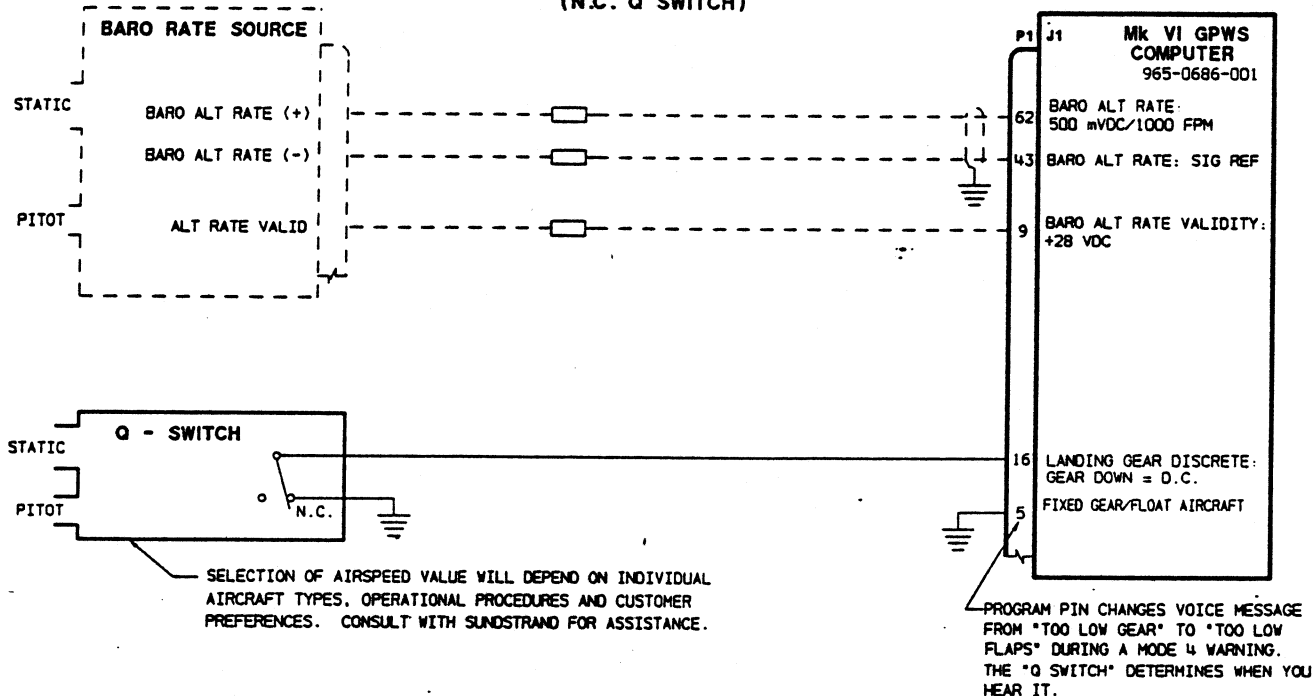
GENERAL NOTES:

CONSULT CUSTOM AVIONICS WIRING DIAGRAMS OF INDIVIDUAL AIRCRAFT RECEIVING Mk VI GPWS INSTALLATION FOR TYPE OF AVIONIC EQUIPMENT INSTALLED & FOR WIRING TERMINATION POINTS. IN ADDITION, REFER TO MANUFACTURER'S INSTALLATION INSTRUCTIONS FOR EQUIPMENT'S PARTICULAR MODEL NO., MODIFICATIONS, AND APPLICABLE CONNECTOR PIN NO.s.

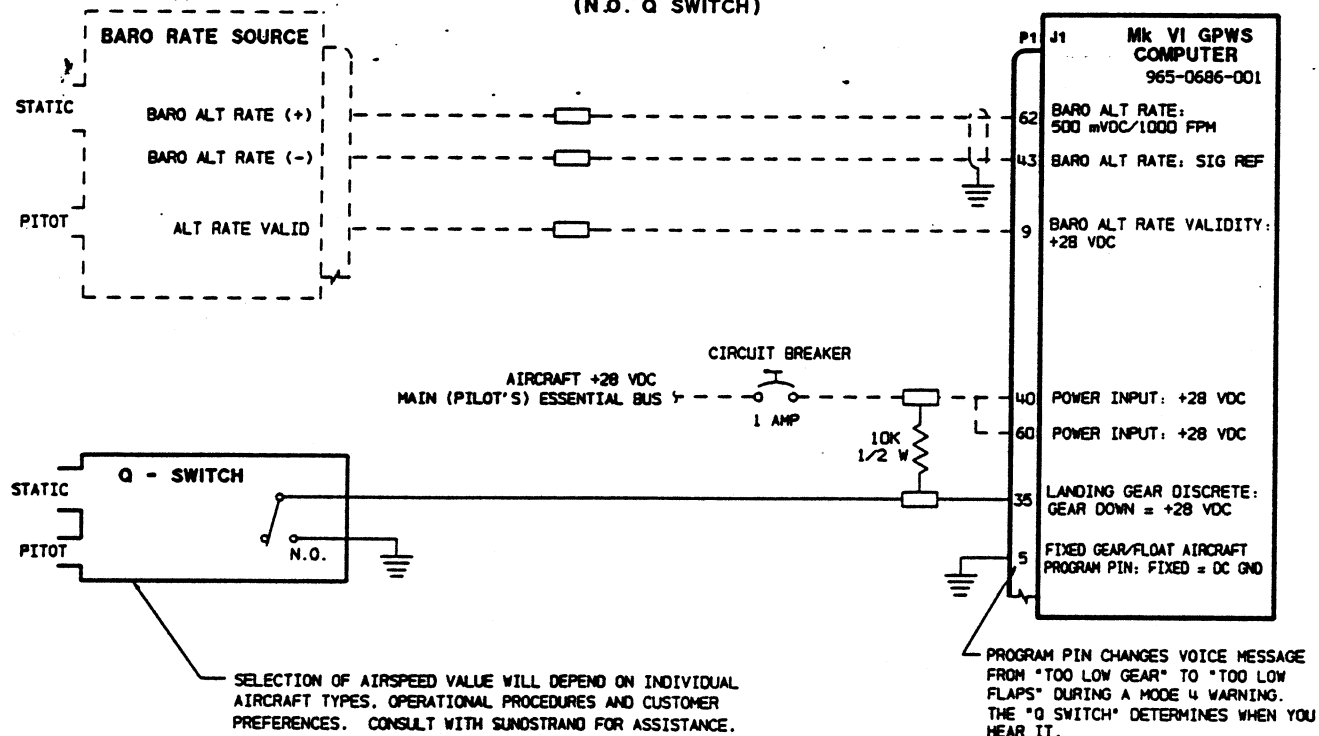
--- = EXISTING A/C WIRING
 = JUNCTION OR SPLICE
 = DC GROUND

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FIXED LANDING GEAR/FLOAT AIRCRAFT (N.C. Q SWITCH)



FIXED LANDING GEAR/FLOAT AIRCRAFT (N.O. Q SWITCH)



GENERAL NOTES:

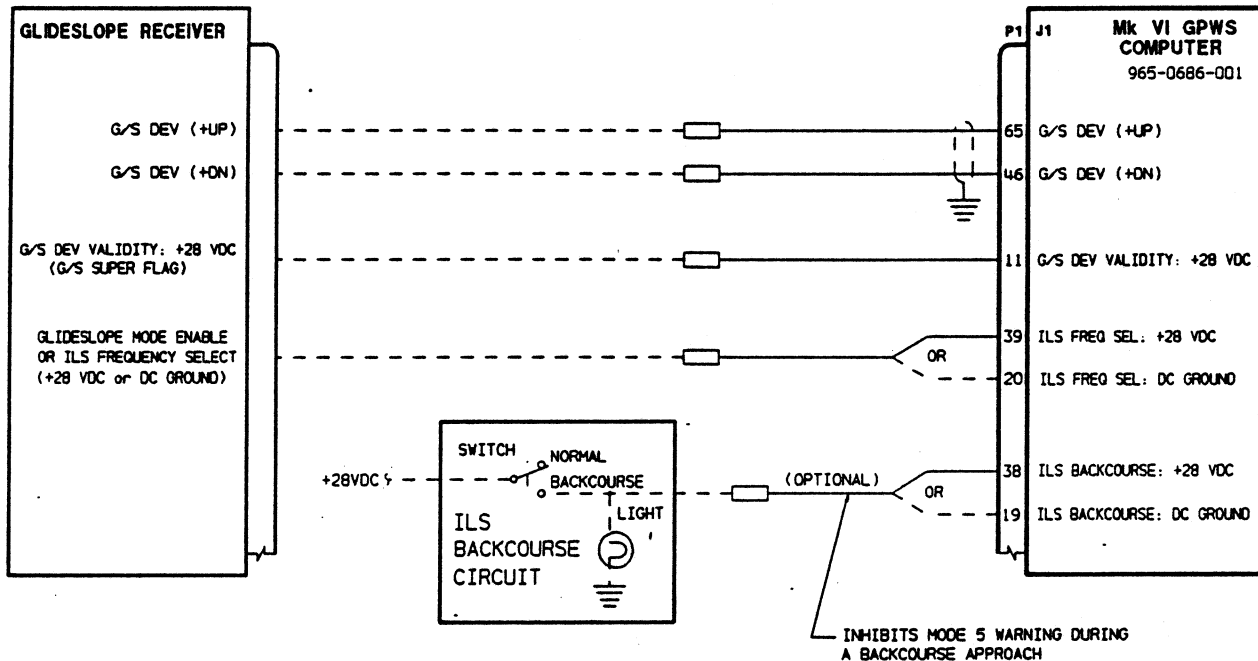
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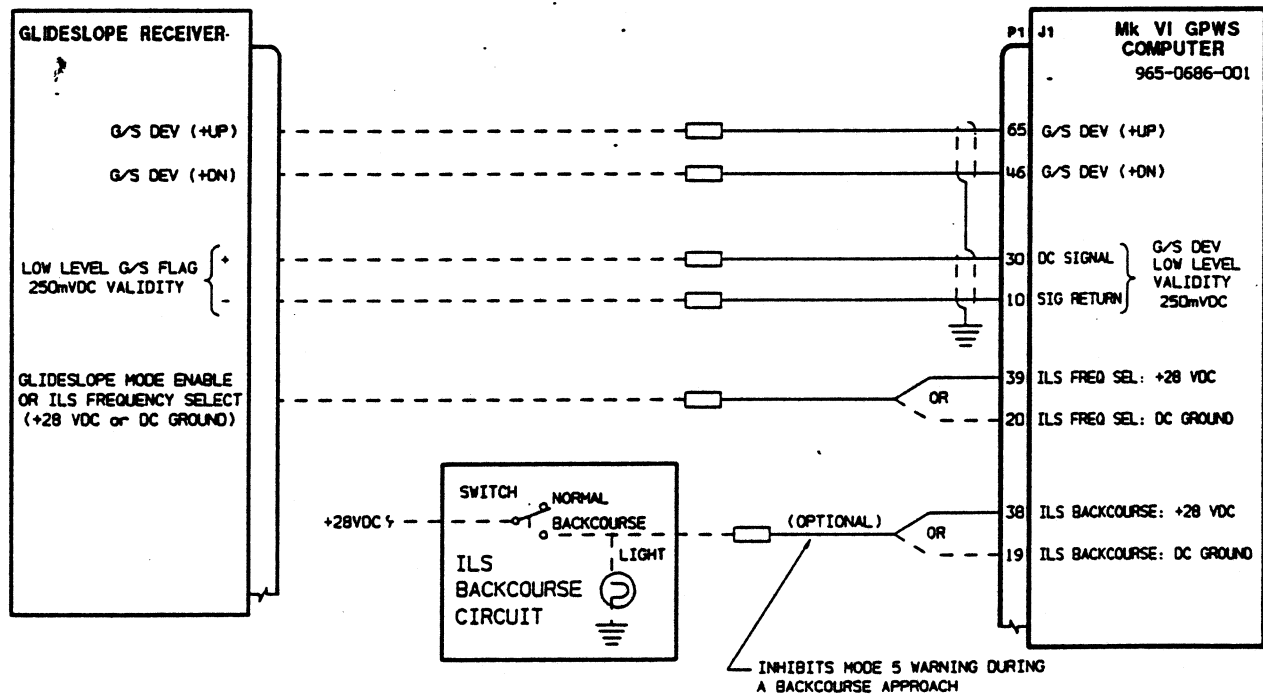
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GLIDESLOPE - SUPER FLAG



LOW LEVEL GLIDESLOPE FLAG



GENERAL NOTES:

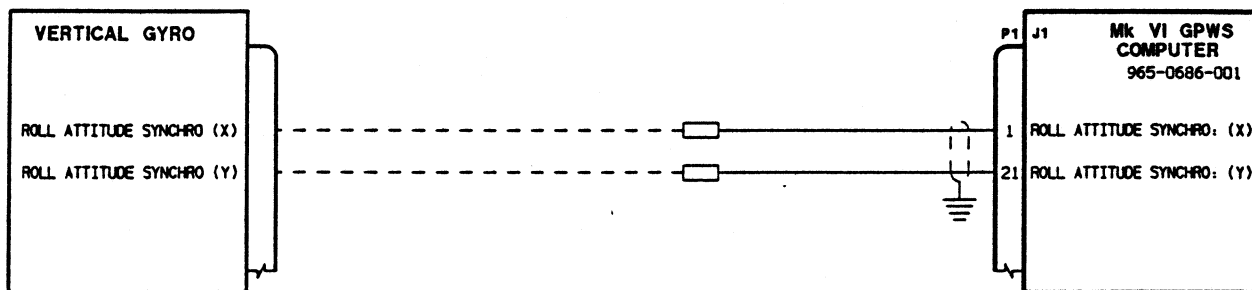
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--- = EXISTING A/C WIRING
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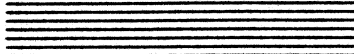
VERTICAL GYRO (OPTION)
USED FOR "BANK ANGLE"



GENERAL NOTES:

CONSULT CUSTOM AVIONICS WIRING DIAGRAMS OF INDIVIDUAL AIRCRAFT RECEIVING Mk VI GPWS INSTALLATION FOR TYPE OF AVIONIC EQUIPMENT INSTALLED & FOR WIRING TERMINATION POINTS. IN ADDITION, REFER TO MANUFACTURE'S INSTALLATION INSTRUCTIONS FOR EQUIPMENT'S PARTICULAR MODEL NO., MODIFICATIONS, AND APPLICABLE CONNECTOR PIN NO.s.

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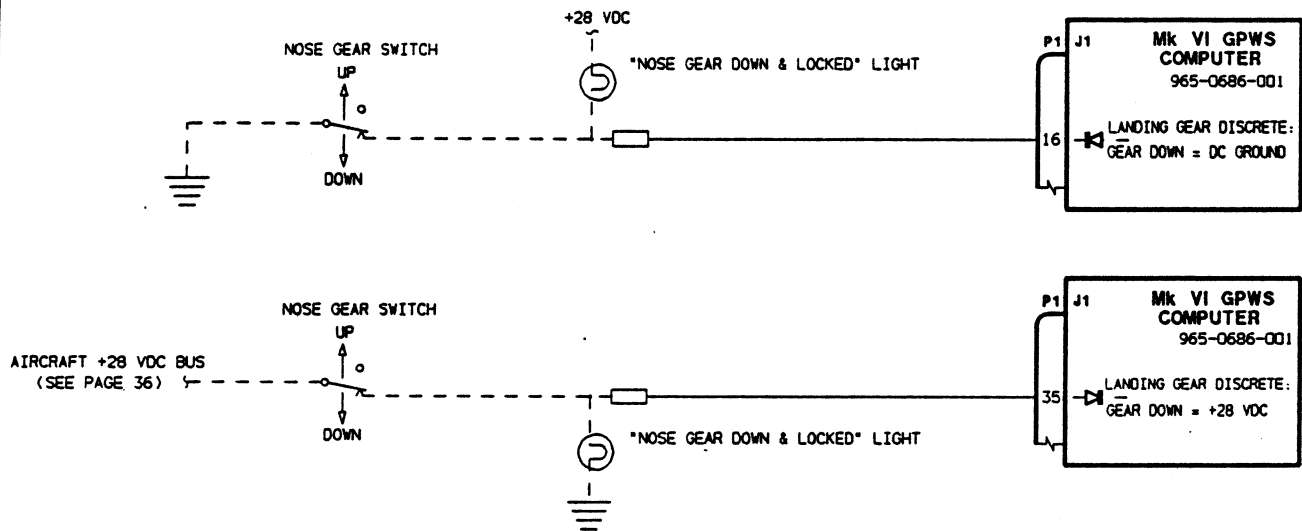


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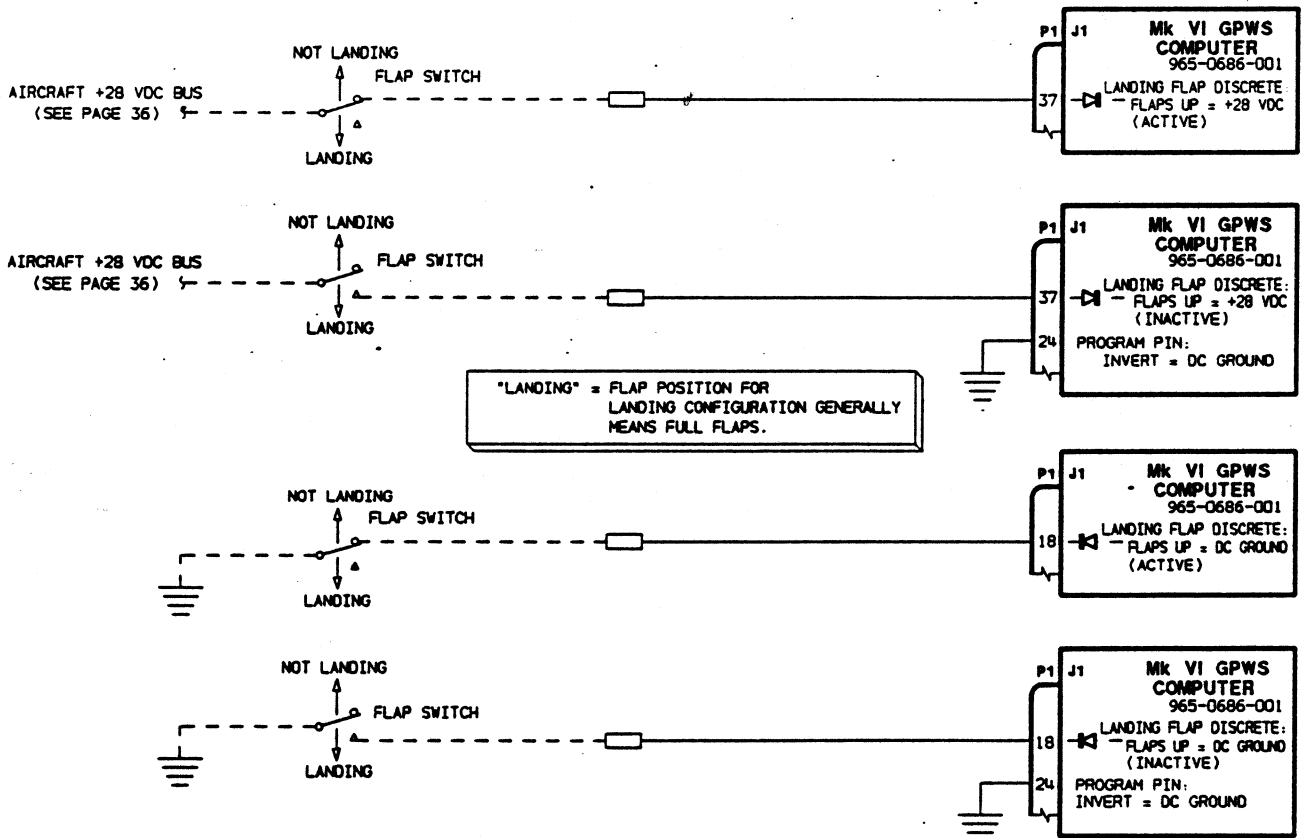
LANDING GEAR - ARRANGEMENTS

RETRACTABLE

NOTE: FOR FIXED LANDING GEAR / FLOAT AIRCRAFT, SEE WIRING FOR Q SWITCH INSTALLATION - PAGE 44.



FLAP INPUT - ARRANGEMENTS



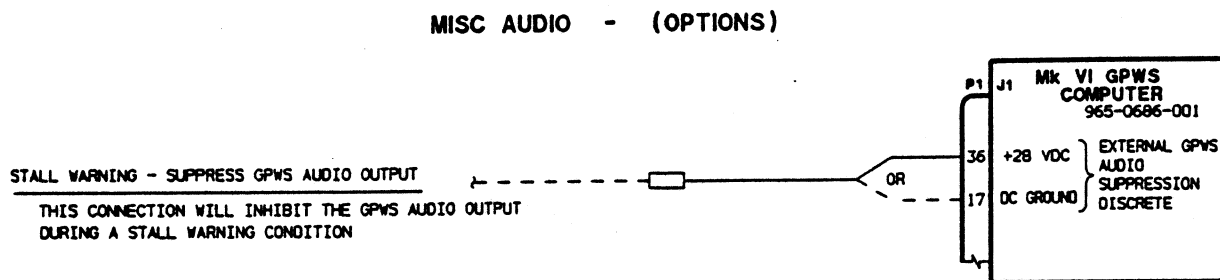
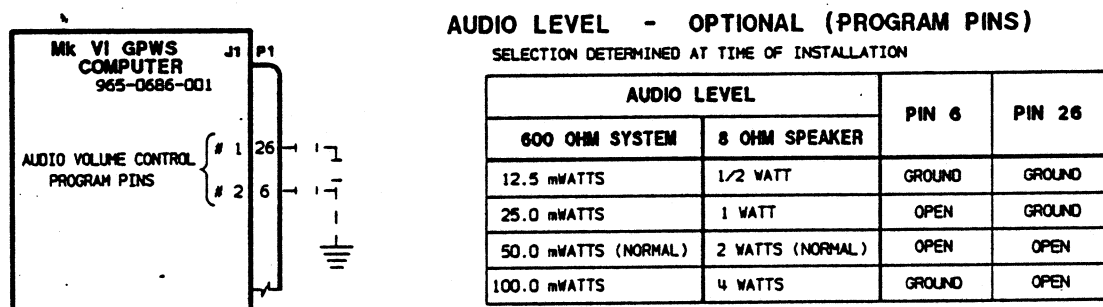
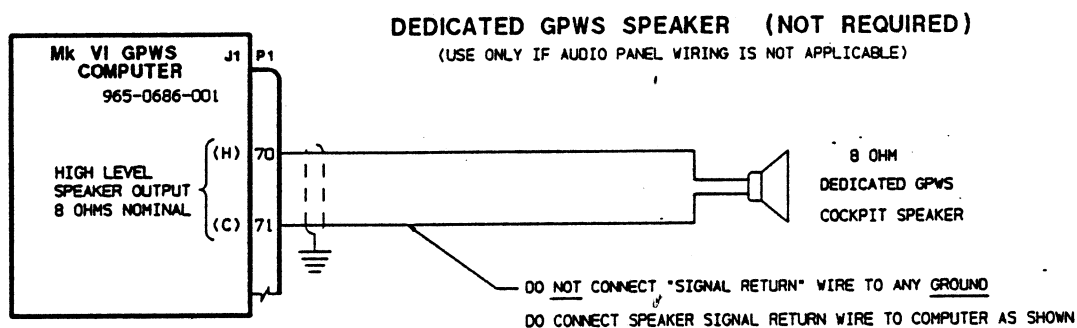
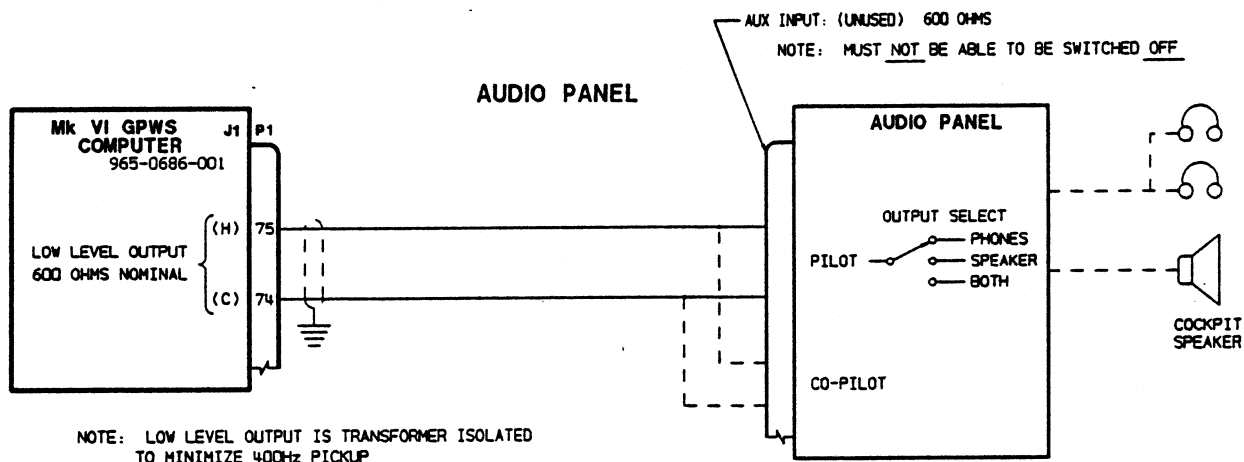
GENERAL NOTES:

CONSULT CUSTOM AVIONICS WIRING DIAGRAMS OF INDIVIDUAL AIRCRAFT RECEIVING Mk VI GPWS INSTALLATION FOR TYPE OF AVIONIC EQUIPMENT INSTALLED & FOR WIRING TERMINATION POINTS. IN ADDITION, REFER TO MANUFACTURE'S INSTALLATION INSTRUCTIONS FOR EQUIPMENT'S PARTICULAR MODEL NO., MODIFICATIONS, AND APPLICABLE CONNECTOR PIN NO.s.

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 = DC GROUND

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GENERAL NOTES:

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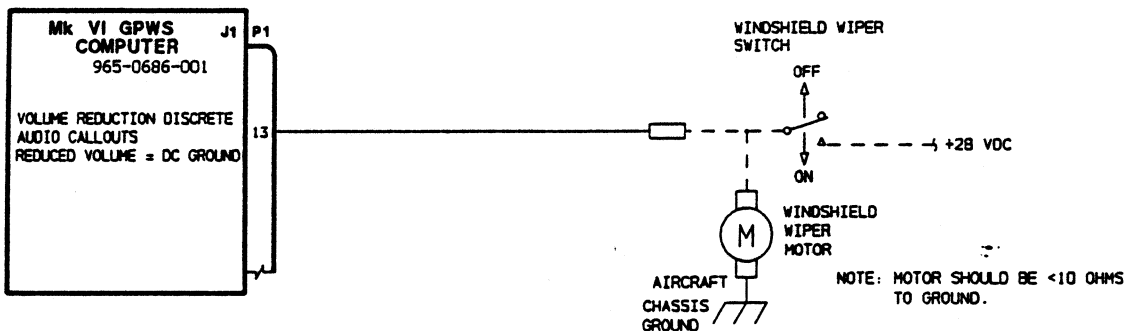
--- = EXISTING A/C WIRING
— = JUNCTION OR SPLICE
⏏ = DC GROUND

OBSERVE GOOD AIRCRAFT AUDIO WIRING PRACTICE TO MINIMIZE NOISE

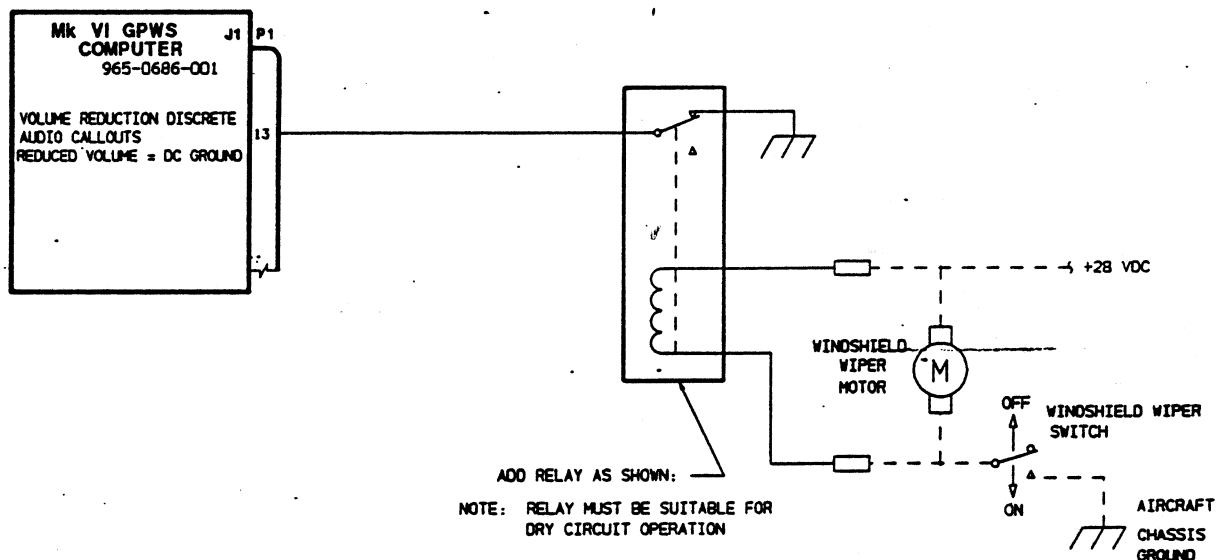
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WIPER MOTOR WITH SWITCH ON THE POWER SIDE



WIPER MOTOR WITH THE SWITCH ON THE GROUND SIDE



NOTE: MODE 6 AUDIO LEVEL REDUCTION (OPTIONAL)

IF EITHER ARRANGEMENT AS SHOWN ABOVE IS USED, THE ACTIVATION OF THE WINDSHIELD WIPERS WILL INHIBIT THIS AUDIO REDUCTION AND WILL RETURN TO THE NORMAL LEVEL AS SELECTED AT TIME OF THE INITIAL INSTALLATION WIRING.
SEE CHART, PAGE 44.

GENERAL NOTES:

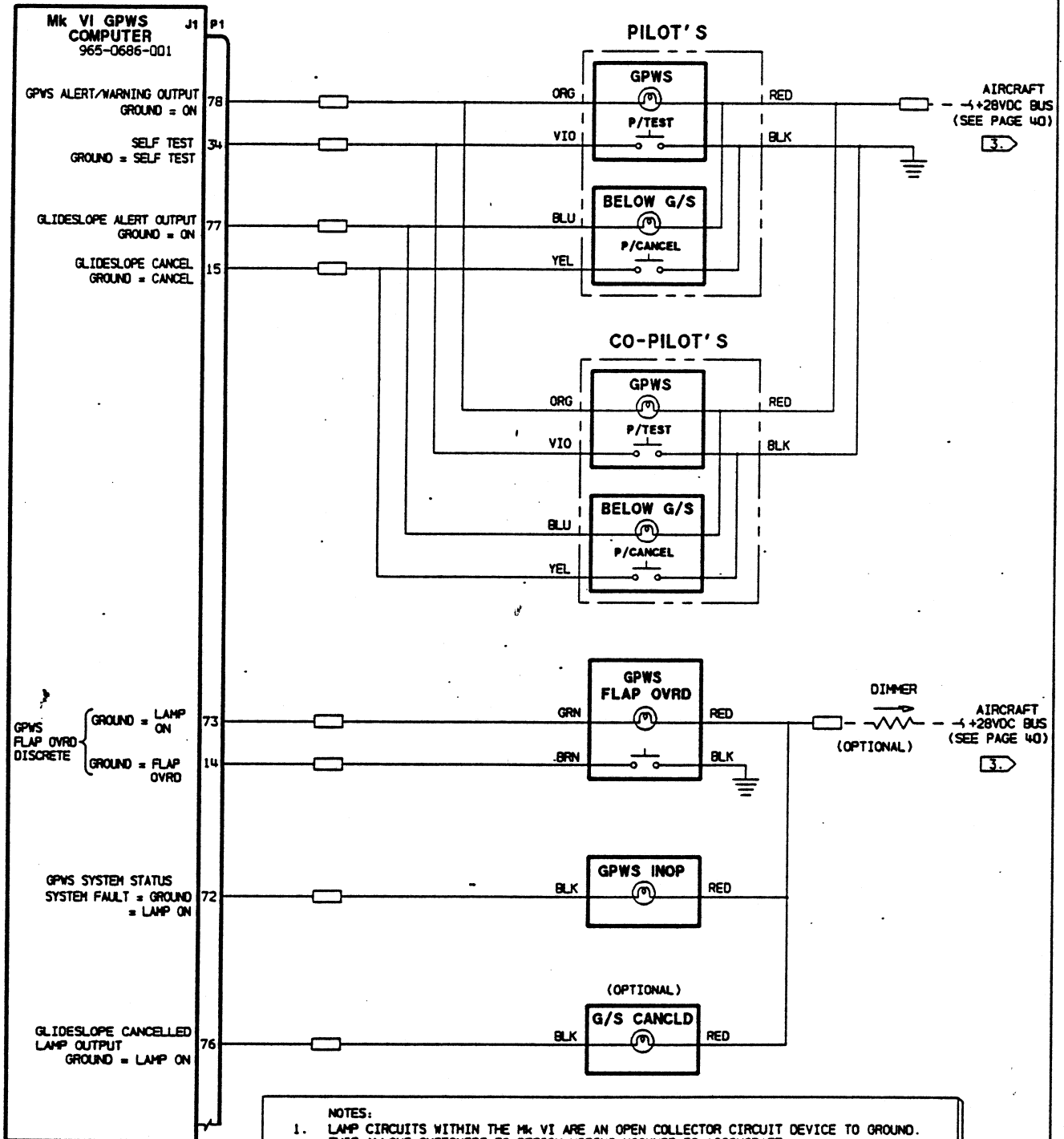
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 = JUNCTION OR SPLICE
 = DC GROUND

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GPWS LIGHTS



NOTES:

- LAMP CIRCUITS WITHIN THE Mk VI ARE AN OPEN COLLECTOR CIRCUIT DEVICE TO GROUND. THIS ALLOWS CUSTOMERS TO DESIGN WIRING HOOKUPS TO ACCOMMODATE "PUSH TO TEST" FEATURES ON ALL GPWS LIGHTS.
- MAXIMUM NOMINAL LAMP LOAD PER LAMP DRIVER = 200 mA DC.

Mk VI COMPUTER AND GPWS MUST BE ON SAME ELECTRICAL BUS, BUT SEPARATE BREAKERS.

GENERAL NOTES:

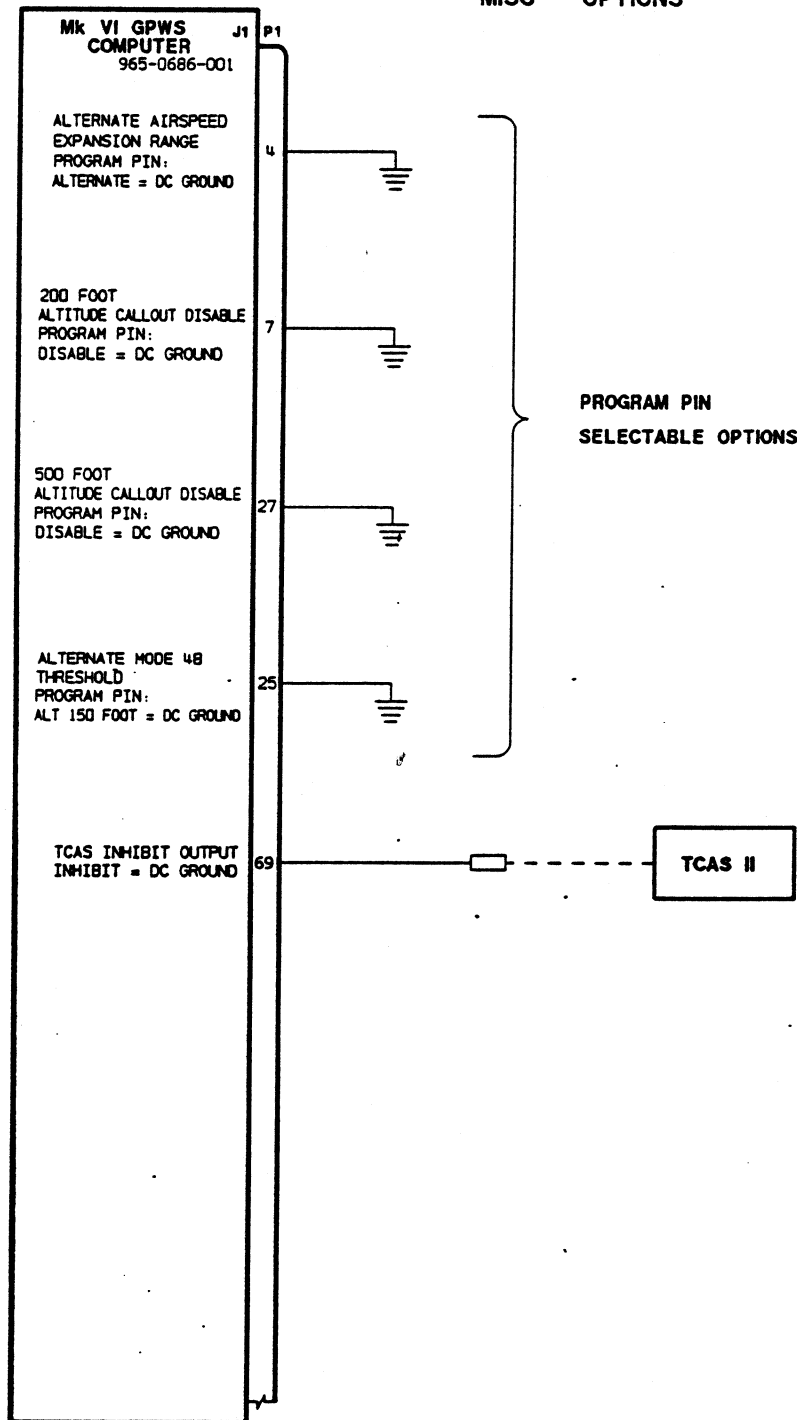
CONSULT CUSTOM AVIONICS WIRING DIAGRAMS OF INDIVIDUAL AIRCRAFT RECEIVING Mk VI GPWS INSTALLATION FOR TYPE OF AVIONIC EQUIPMENT INSTALLED & FOR WIRING TERMINATION POINTS. IN ADDITION, REFER TO MANUFACTURE'S INSTALLATION INSTRUCTIONS FOR EQUIPMENT'S PARTICULAR MODEL NO., MODIFICATIONS, AND APPLICABLE CONNECTOR PIN NO.s.

--- = EXISTING A/C WIRING
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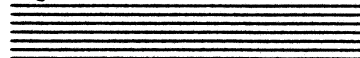
MISC - OPTIONS



GENERAL NOTES:

CONSULT CUSTOM AVIONICS WIRING DIAGRAMS OF INDIVIDUAL AIRCRAFT RECEIVING Mk VI GPWS INSTALLATION FOR TYPE OF AVIONIC EQUIPMENT INSTALLED & FOR WIRING TERMINATION POINTS. IN ADDITION, REFER TO MANUFACTURE'S INSTALLATION INSTRUCTIONS FOR EQUIPMENT'S PARTICULAR MODEL NO., MODIFICATIONS, AND APPLICABLE CONNECTOR PIN NO.s.

--- = EXISTING A/C WIRING
 [] = JUNCTION OR SPLICE
 [] = DC GROUND



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RESEARCH, WASHINGTON 20072-0701

31. STC Submittal - Required Documents

The following list identifies the documents that will typically be required for obtaining a Supplemental Type Certificate (STC) for a New Aircraft Type installation with the FAA. There may also be additional documentation required for each unique installation. Sundstrand plans to obtain STC approval for various aircraft types thru the FAA N.W. Mountain Region office.

Follow-on installations may require specific installation drawings, and comparison/justification of similarity to a previous STC on the type; i.e. installation of new sensors may require additional justification.

1. Certification Plan

Includes basic plan for applying for STC, a review of system and installation against regulations (such as FAR 23), similarity (compliance) to previous STC installations, and identification of new parts that will require "Parts Conformity".

2. STC Drawing Package [specific to the aircraft (tail no.) being used for STC approval]

Master Drawing List (Top sheet of drawing package)

Electrical Installation Drawings (Wiring Diagrams)

Mechanical Installation Drawings

Installation procedure (Engineering Authorization)

3. Stress Analysis

Crash Safety Analysis on Mk VI Computer and Rack Installation mounting.

Generic computer and rack analysis. If the installation is unique, then a new analysis specific to this installation will be required.

4. Strength Analysis

Crash Safety Analysis on miscellaneous added components to the Mk VI installation, i.e. added brackets, trays, shelves, etc, unique to the individual aircraft installation.

5. Electrical Load Analysis

To include: (a) Electrical load (watts) in "Warning" & "Non-Warning" modes of the Mk VI System, for components added to the existing avionics for this STC. This includes: Mk VI Computer, Air Data (if required), lights, etc.

(b) Comparison of these loads to existing aircraft bus.

6. **Installation Lightning Analysis**
 Statement indicating the Lightning tests per RTCA/DO-160B that were performed during Qualification Testing at Sundstrand on the Mk VI Computer.
7. **Reliability/Safety Analysis**
 FEMA - of Signal Isolation for the Mk VI System as installed on aircraft.
8. **Line Maintenance Manual**
 For Mk VI System
9. **Ground Test Procedure**
 Electrical system checkout of the Mk VI installation. May be witnessed by FAA.
10. **Flight Manual Supplement**
11. **Flight Test Plan**
12. **Flight Test Report**

32. Ground Rules for Supplemental Type Certification of Mk VI GPWS Installation and Approval on Aircraft Operating under FAR 135

The ground rules for certifying Mk VI GPWS on aircraft operating under Part 135, follow the same F GPWS certification ground rules that were established in 1975 through 1978 for use on Part 121 aircraft.

1. Radio Altimeter Sensor

- 1.1 The radio altimeter used by the GPWS must have a minimum 2,500 foot range with ample dynamic tracking performance in terrain (TSO-C87). Sundstrand has evaluated various radio altimeters in terrain on its own aircraft and other aircraft. Presently Sundstrand Data Control recommends the following radio altimeters:

- Bendix King KRA-405
- Honeywell AA-300 (Mod "M" or later only)
- Honeywell YG-7502
- Collins ALT-55 series
- Collins AL-101]
- Bendix ---] ARINC 552 Airline Quality
- TRT AVH-A11]

Sundstrand considers the following radio altimeters as unacceptable at this time for approval with the Mk VI:

- Honeywell AA-200 Series
- Collins ALT-50 Series
- Bendix/King KRA-10
- Terra 3000/3500

- 1.2 For each aircraft type not certified with the Mk VI, the complete system with each radio altimeter type, each antenna type and each new antenna location must be flown in terrain to demonstrate adequate tracking, demonstration of range, and adequate GPWS excessive closure rate warnings.
- 1.3 If a different or new radio altimeter type or antenna type is utilized with the Mk VI on a previously approved Mk VI installation, the system must be flown to demonstrate adequate tracking and adequate GPWS excessive closure rate warnings.
- 1.4 For new locations of the antenna, reflight in terrain is required. If the T/R unit and the distance antenna coax cable is lengthened by more than 15 feet over previous approvals, a reflight in terrain is to be performed.

- 1.5 Terrain locations and test criteria for demonstration of performance are located around the U.S. (For various geographic locations, see attachment A (Example) STC - Flight Test Plan 060-3956-000).
- 1.6 The Radio Altimeter Indicator should be located so it can be seen by either pilot. Sundstrand Data Control recommends that the indicator has an "Altitude Alert" function ("MDA", "DH", etc.) and light, and with flight operational procedures concerning its use.
- 1.7 Activation of a radio altimeter self-test function, if used, must not cause a GPWS alert or warning.

2. Air Data (Vertical Speed, Air Speed, etc.) Sensor

- 2.1 For each new Air Data source, on each new aircraft type not previously certified with Mk VI, a flight demonstration of high descent rate is required. In particular, the air data sensor and Pitot static lines and connection should not lead to an excessive delay of the alert or warning for descent after takeoff, or for excessive descent rate during approach. In Part 121 GPWS installations, large scaling inaccuracies in the vertical speed indicator (VSI) were often encountered in some instruments (>100%). Some Part 135 aircraft may also have large VSI scaling errors. Other error sources are ground effect, angle of attack, sideslip, landing gear doors, and gear and flap position. The FAA allows +/- 20% tolerances for GPWS aircraft flight tests. To get repeatable results, the aircraft has to be stabilized in the desired descent rate. Pilot technique can effect the observed results. The MK VI GPWS computer itself is within +/- 5%.
- 2.2 A good ground functional test should be able to check the accuracy of the Vertical Speed Indicators and the excessive descent rate alert/warning, along with airspeed or "Q" Switch GPWS function, with no flying required.

3. Glideslope Deviation and Flag

- 3.1 Flight demonstration of proper GPWS glideslope alert function is required for each type of receiver used. However, if the same receiver type has been previously approved, then a good ground functional check is all that is required.

- 3.2 Ground tests should verify that the glideslope signal used for GPWS is directly from the Captain's glideslope receiver, and is independent of autoflight director mode status or switching. If a backcourse inhibit is used (a desired feature), it should be verified that this function works correctly.

4. Landing Gear and Landing Flap Discrete

- 4.1 Landing gear down position switch or the cockpit landing gear down selection handle can be utilized for the Mk VI GPWS. A simple flight demonstration should verify correct operation.
- 4.2 The "landing flap" setting discrete should be the normal landing flap position used in operations. The flap discrete setting is important, as a landing flap position also used for maneuvering will probably not provide adequate terrain clearance warning when needed during initial approach where risk is highest for a terrain strike. A flap position that overlaps with a take-off flap setting will also disable an alert for descent during initial take-off climb.

5. Audio and Visual Annunciation

- 5.1 The audio level must be adequate to be heard above high cockpit background noise, such as during power on, high descent speeds, yet quiet enough to not be startling during low power, low speed approaches.
- 5.2 Sundstrand Data Control recommends that for aircraft with high noise windshield rain removal equipment, that the automatic audio level increase feature found in the Mk VI be utilized, so that the GPWS can be heard when needed in heavy rain.
- 5.3 Visual annunciation of GPWS alerts warnings should be located in front of each pilot, and wherever possible, in their primary field of view. The "Below Glideslope" alerting visual annunciation should be either co-located with the GPWS warning lamp, or located near the glideslope deviation indicator. The GPWS "INOP" visual annunciation should be visible to one of the pilots, but should not obscure or distract from the pilot's primary field of view.

6. Disabling the GPWS

The GPWS can be partially disabled only under specific conditions allowed by the FAA

- 6.1 For deliberate flight below the glideslope in visual conditions, such as landing short of a displayed threshold runway, or visually relocating on approach to a parallel runway below the glideslope, either pilot can inhibit the glideslope alert by means of a momentary only switch. Switches preferably are integral to the visual "Below Glideslope" alert annunciators.
- 6.2 Stall warning can be optionally used, if desired by the FAR 135 operator, to inhibit GPWS. Part 121/CAA Spec 14 (UK) GPWS installations have been approved and certified both ways.
- 6.3 GPWS warnings should inhibit TCAS II Resolution Alerts (RA).
- 6.4 For flapless landings, a "GPWS FLAP OVRD" switch with integral visual annunciator can be used. On Part 121 installations, this switch was only used where normal landing flaps could not be used. Its use was determined in the approved Aircraft Flight Operations Procedure Manual. The Mk VI "GPWS FLAP OVRD" function is also to be controlled by the approved flight procedure manual.

For Part 135 operations, the "GPWS FLAP OVRD" switch gives some further operational flexibility to de-sensitizing the GPWS. Its use allows steeper than normal approaches and reduced terrain clearances down to the minimum FAA TSO values.

The "GPWS FLAP OVRD" automatically resets "off" after landing, or can be manually reset airborne by either pilot. It allows the Mk VI to be operationally compatible at specific "problem" airfields, where a normal GPWS would have to be completely disabled. Its use, however, must be approved by flight procedures used by the carrier.

7. Other

- 7.1 Ground tests should be performed to demonstrate that loss of power to the prime GPWS sensors, radio altimeters and air data (except glideslope receiver), result in a GPWS "INOP" visual annunciation, and the GPWS will not pass an "all OK" cockpit self-test.

- 7.2 Normal use and activation of other aircraft systems and avionics should not cause nuisance aural or visual GPWS alerts or warnings. Likewise, the operations of GPWS, or the activation of GPWS self test to generate GPWS alerts and warnings, shall not interfere with other aircraft systems.
- 7.3 Loss of power to GPWS must not interfere with landing gear position indication or operation, or flap position indication or operation. Likewise, loss of power to landing gear, or flap position should not result in false GPWS alerts or warnings.

Some Reference FAA GPWS Installation Guidance Material

1. Federal Register Vol. 57 No. 55
Friday March 20, 1992 Rules and Regulations D.O.T. FAA 14 CFR 135 (Docket No.26202 Amendment No. 135.42). RIN 2120-AD29 Final Rule: Ground Proximity Warning Systems.
2. RTCA DO-161 A Revision May 27, 1976
Minimum Performance Standards. Airborne Ground Proximity Warning Equipment.
3. Part 37.201 Technical Standard Order Authorization (TSO-C92b)
First published Federal Register Tuesday, May 6, 1975, Vol. 40, Amended Vol. 41, No. 162 - Thursday Aug 19, 1976.
4. FAA Advice to its Regions Regarding Obtaining Approval of GPWS Installations.
Attachment to E & M Execs. Memo 75-1 29 Jan 1975 Original signed by C.R. Melugin Jr. for R. Skully AFS-1.
5. Airplane Flight Manual Procedures for Deactivating Ground Proximity Warning System.
8110.28 J.A. Ferrarese AFS-160 1/18/77.
6. June 1975. Skully AFS-1 Telex Memorandum on HQ GPWS Intent - Defining "How to deactivate GPWS" - Lockwired switch or circuit breaker requiring maintenance by entry and "Override" function to allow GPWS to remain operative during abnormal or emergency conditions. No requirement for dual visual warning annunciation, but must be in full view of either pilot. Visual glideslope alert annunciation not required and means to inhibit.

Radio Altimeters

Manufacturer/ Model No.	Range (Feet)	Scaling (Arinc 552/ALT 55)	Decision Height (Y/N)	Valid (Y/N)	MK VI COMPATIBLE
Collins ALT 50B	-20 to 2000	ALT 55	Y	Y	N
Collins ALT 55A	-20 to 2500	ALT 55	Y	Y	Y
Collins AL-101	-20 to 2500	ARINC 552	Y	Y	Y
Honeywell YG-7502/HG-7502	-20 to 2500	ARINC 552	Y	Y	Y
Sperry/Honeywell AA-300	-20 to 2500	ARINC 552	Y	Y	Y
Sperry AA-200					N
King KRA-405	-20 to 2500	ALT 55	Y	Y	Y
King KRA 10A	20 to 2500	4mVDC/ft	Y	N	N
Terra 3000/TRI 40	40 to 2500	20 mVDC/ft	Y	N	N
Terra 3500	0 to 2500	20 mVDC/ft	Y	N	N
Bendix ALA-51A	-10 to 2500	ARINC 552			Y
TRT AVH-A11	-20 to 2500	ARINC 552			Y

Air Data Computers

Manufacturer/ Model No.	BaroRate Scaling (VDC/1000 ft/min)	BaroRate Range (ft/min)	Airspeed Scaling (mVDC/kt)	Airspeed Range (kts)	Air Data Valid	MK VI COMPATIBLE
CIC 8800M/PN 04077	0.5	+/-10,000	22.2	90 to 270	Y	Y
CIC 8700-XX-60-270-0-10	N/A	N/A	?	variable	N/A	N
CIC 8600-XX-	Altitude only					N
CIC 8400-XX			?	variable	N/A	N
CIC 8300-XX			?	variable	N/A	N
CIC 8200-XX	Altitude only					N
CIC 8000-XX	Altitude only					N
B&D 2600	ARINC 429	+/-20,000	ARINC 429	50 to 500	Y	N
B&D 2800A	ARINC 429	+/-20,000	ARINC 429	0 to 1150	Y	N
B&D 2504-901-4121	ARINC 429	+/-20,000	ARINC 565	0 to 500	Y	N
Sperry AZ 241	0.5	+/-10,000	22.22	60 to 450	Y	Y
Sperry AZ 242	0.5	+/-10,000	22.22	60 to 450	Y	Y
Sperry AZ 600	0.5	+/-10,000	22.22	60 to 450	Y	Y
Sperry AZ 648	0.5	+/-10,000	11.11	60 to 400	Y	N
Sperry AZ 800	0.5	+/-20,000	22.22	60 to 450	Y	Y
Sperry AZ 810	0.5	+/-20,000	22.22	60 to 450	Y	Y
Honeywell D80 C						
Collins ADS 65	0.0006	+/-10,000	20	100 to 300	Y	N
Collins ADC 80K	ARINC 565	+/-20,000	65	30 to 450	Y	N
Collins ADS 81/82A	0.5	+/-20,000	20	30 to 450	Y	N
Collins ADC 82C (L)	0.5	+/-20,000	24 or 65 (25)	30 to 450	Y	N
Collins ADC 85	ARINC 429	+/-20,000	ARINC 429	30 to 510	Y	N
Collins ADC 86	ARINC 429	+/-20,000	ARINC 429	30 to 510	Y	N
Collins ADC 590A-5	ARINC 429	+/-20,000				N
Kollsman A32069-10-10	Sync Alt only					N
Kollsman 43010-E2300						N
IDC 422-18152-982	Altitude only		ARINC 565	115 to 400		N
IDC 630-37070-XXX	Altitude only		ARINC 565	100 to 380		N
IDC 575-26320-XXX	Altitude only		24	60 to 400		N
King KDC 222-2	N/A		23.8	0 to 270		N
King KAD 280	ARINC 429		ARINC 565	40 TO 599		N
King KDC 298 + ILS	NONE		NONE			N
King KDC 380	3.6V/ft/m		?	50 to 450		N
King KDC 480	ARINC 429	+/-20,000	ARINC 429	0 to 450		N
UNS ADS-550	ARINC 429	+/-20,000	ARINC 565	40 to 599		N
Rosemount 102AU-1AG						N
Evergreen 581A	ARINC 429/565	+/-20,000	ARINC 429/565	0 to 400	Y	N